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=> s DE4303973/pn
L1            1 DE4303973/PN

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L1   ANSWER 1 OF 1  WPIX COPYRIGHT 2009       THOMSON REUTERS on STN
AN   1993-265811 [34]    WPIX  Full-text
DNC  C1993-118449 [34]
TI   Mixer assembly for viscous mass within closed bag  - has slot formed by
     two opposing rollers both of which have toothed profile
DC   A35; J02
IN   BADER K; IHASZ T; KREBS P
PA   (DEGS-C) DEGUSSA AG
CYC  1
PIA  DE 4303973       A1 19930819 (199334)* DE   6[1]                    <--
     DE 4303973       C2 19940908 (199434)  DE   6[1]                    <--
ADT  DE 4303973 A1 DE 1993-4303973 19930211; DE 4303973 C2 DE 1993-4303973
     19930211
PRAI DE 1992-4214018       19920429
     DE 1992-4204496       19920214
AN   1993-265811 [34]    WPIX  Full-text
AB    DE 4303973 A1   UPAB: 20050510
      A mixer assembly for a viscous mass within a closed bag incorporates a slot
      whose limits are so dimensioned that the bag and enclosed viscous mass may
      pass through a mangle slot so at least a part of the mass is subjected to
      shear action and passes through the slot more quickly than the bag. The
      slot is formed by two opposing rollers both of which bear a toothed profile
      and one of which incorporates a screw thread groove endowing a lateral
      shearing motion on the bag contents as they pass through the slot.
      USE/ADVANTAGE - The process and assembly mix two or more viscous components
      contained in closed bags. The bag contents are thoroughly mixed,
      irrespective of the size of the bag and different viscosity characteristics
      of the contents.
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Member(0002)
ABEQ DE 4303973 C2 UPAB 20050510
A mixing device for a viscous material in a closed bag includes a gap with dimensions such that the bag and its contents can pass through it, and such that a proportion of the contents have an active side sheer movement and/or a higher volume speed than the bag, and a roller section. The prim. roller has an opposite sec. roller. At least one of the rollers is driven and can move the bag through the gap. The rollers are pref. finished off with rubber or plastic.

ADVANTAGE - The device is efficient and reliable. Bags of differing dimensions and contents of differing viscosity can be mixed quickly.

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(54) **Verfahren und Vorrichtung zur Herstellung disperser Systeme, insbesondere Salben, Cremes, Suspensionen, Emulsionen, Gele oder Pasten**

Method and apparatus for the production of dispersed systems, in particular ointments, creams, suspensions, emulsions, gels or pastes

Procédé et dispositif de fabrication de systèmes dispersés, en particulier des onguents, crèmes, suspensions, émulsions, gels ou pâtes

(84) Benannte Vertragsstaaten:
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(56) Entgegenhaltungen:
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Beschreibung

[0001] Die Erfindung betrifft ein Verfahren zur Herstellung disperser Systeme, insbesondere von Salben, Cremes, Suspensionen, Emulsionen, Gele oder Pasten und Vorrichtungen zur Durchführung einzelner Schritte dieses Verfahrens.

[0002] Disperse Systeme, wie Salben, Cremes, Suspensionen, Emulsionen, Gele oder Pasten werden bislang überwiegend durch Verrühren der einzelnen Mischungsbestandteile miteinander hergestellt. Das Rührverfahren hat jedoch erhebliche Nachteile. Es ist zeitaufwendig und in den Rührvorrichtungen bleibt ein merklicher Anteil des Rührgutes an den Vorrichtungswandungen und den Rührwerkzeugen zurück. Der Mischungsvorgang kann praktisch nicht unter Luftabschluss erfolgen, und ein Erwärmen oder Abkühlen des Rührgutes kann wegen der bestehenden ungünstigen Wärmeübergangsverhältnisse in den Vorrichtungen nur relativ langsam erfolgen.

[0003] In der US-A-3,332,670 wird eine Vorrichtung zum Mischen beschrieben, die einen von Hand betätigbaren Roller aufweist, mit dem das in einem Beutel befindliche Mischgut von einer Stelle zu einer anderen Stelle verschoben wird, in dem die Beutelwandungen durch den profilierten Roller an wechselnden Stellen zusammengedrückt werden.

[0004] Auch die FR-A-2.152.618 beschreibt eine ähnliche Mischvorrichtung, in der ein Beutel mit Mischgut einer reinen Druckbeaufschlagung unterzogen wird, wobei hier der Druck durch zwei angetriebene Stößel erzeugt wird.

[0005] Der Erfindung liegt die Aufgabe zugrunde, ein Verfahren und Vorrichtungen zu schaffen, die unter erheblicher Einsparung an Zeit und Energie eine verlustfreie Herstellung disperser Systeme erlauben.

[0006] Die gestellte Aufgabe wird erfindungsgemäß durch ein Verfahren mit den aus dem Hauptanspruch ersichtlichen Verfahrensschritten gelöst.

[0007] Bei dem Verfahren gemäß der Erfindung wird durch das Einbringen der Mischungsbestandteile in einen flexiblen Beutel und ihr Verbleiben in diesem Beutel während des gesamten Herstellverfahrens ein Verlust an Mischung vollständig vermieden. Außerdem lässt sich die Behandlung des Mischgutes unter völligem Luftabschluss durchführen. Beim Ausbringen der fertigen Mischung aus dem Beutel lässt sich ein an der Beutelwandung verbleibender Mischungsrückstand äußerst klein halten, weil sich die Mischung aus dem flexiblen Beutel fast vollständig ausquetschen lässt. Wenn die Mischung in eine Quetschtube als Speichergefäß gelangen soll und die Mischung in der für eine einzige Tube vorgesehenen Menge hergestellt wird, lässt sich die fertige Mischungsmenge auch zusammen mit dem Schlauchbeutel in die Quetschtube einbringen. Merkliche Zeitverluste beim Einfüllen von Mischungsbestandteilen und beim Umfüllen von Mischungen lassen sich bei dem erfindungsgemäßen Verfahren vermeiden. Vor allem aber wird das Bilden der dispersen Systeme durch Druckbeeinflussung durch Walken das mit den Mischungsbestandteilen gefüllten Beutels im Vergleich zu den bekannten Verfahren, insbesondere Rührverfahren, auf einen Bruchteil der dort erforderlichen Bearbeitungszeit verkürzt, da das Mischgut bei der Bearbeitung auf eine große Fläche verteilt ist und die gesamte Masse gleichzeitig bearbeitet wird. Außerdem kann jetzt auch ein Emulgieren im Gegensatz zu den bekannten Rührverfahren bei Raumtemperatur erfolgen (* siehe Seite 9). Auch Festbestandteile können von Anfang an mit in den Beutel gegeben und durch das Walken zerrieben und mit der übrigen Masse homogenisiert werden. Da das System vollständig nach außen abgeschlossen ist, kann keine Flüssigkeit verdunsten oder Luft in den Beutel gelangen. Hierdurch werden viele der bislang benötigten Arbeitsschritte wie Ersetzen von verdunsteter Flüssigkeit, Entlüften etc. überflüssig. Das Verfahren eignet sich auch zum Herstellen großer Mengen an dispersen Systemen in Prozessanlagen, wobei eine ebenfalls erhebliche Einsparung an Zeit und Energie möglich ist.

[0008] Die Druckeinwirkung auf den Beutel und seinen Inhalt durch Walken lässt sich auf verschiedene Weise durchführen, wobei sichergestellt sein muss, dass die Mischungsbestandteile bei der Druckbeeinflussung in das eingehaltene Freivolumen des Beutels ausweichen können. Als besonders vorteilhaft hat sich erwiesen, die Druckeinwirkung auf den Beutel und seinen Inhalt durch Walken des gefüllten Beutels zwischen gegenläufig zueinander bewegbaren profilierten Flächen auszuüben. Dabei erfolgt zwischen den Walkflächen eine großflächige und äußerst intensive Mischeinwirkung auf den Beutelinhalt. Durch die profilierten Oberflächen erfolgt eine intensive Durchmischung des Beutelinhalts. Festbestandteile werden zwischen den gegeneinander bewegten Innenflächen des Beutels zerrieben und fein in der Mischung verteilt. Durch diese großflächige Einwirkung auf die Mischung lässt sich bei gehetzten oder gekühlten, gut wärmeleitenden Walkorganen auch eine sehr rasche Erwärmung oder sichere Temperaturhalterung oder eine sehr rasche Abkühlung der Mischung bereits während des Walkvorganges, also der mechanischen Einwirkung auf die Mischungskomponenten, erreichen. Ein Platzen des flexiblen Beutels muss auch bei dem intensiven Walken zwischen gegenläufigen profilierten Flächen nicht befürchtet werden, wenn darauf geachtet wird, dass das Restvolumen im Beutel in jeder Bearbeitungsphase immer größer ist als das von der Füllmasse eingenommene Volumen und die Festbestandteile in pulverisierter Form vorliegen gemäß DAB 10.

[0009] Das Entfernen der Luft aus dem Beutel kann beispielsweise durch Tauchen des gefüllten Beutels in senkrechter Lage in eine Flüssigkeit und Verschließen unterhalb der Flüssigkeitsoberfläche erfolgen oder bei kleineren Einrichtungen auch einfach durch Ausstreifen der Luft aus dem Beutel, was von Hand erfolgen kann.

Das Verfahren lässt sich vorteilhafterweise mit einer Einrichtung durchführen, die für die einzelnen Verfahrensschritte erfindungsgemäß ausgebildete Vorrichtungen aufweist, insbesondere eine Vorrichtung zum Walken des mit den Mischungskomponenten gefüllten Beutels, bei welcher vorteilhafterweise in einem starren Rahmen mindestens ein Paar von miteinander zusammenwirkenden Walkplatten mit profilierter Oberfläche parallel zueinander verschiebbar gelagert sind, die auf ihren einander zugewandten Flächen mit überwiegend quer zu der Verschieberichtung verlaufenden kantenfreien gewölbten Rippen versehen sind, zwischen denen flache Nuten ausgebildet sind. Zwischen diesen Walkplatten, deren gegenseitiger Abstand und Nutvolumen natürlich auf das Füllvolumen und Restvolumen der zu behandelnden Beutel abstimmbar sind, erfolgt eine so großflächige und intensive Walk- und damit Mischeinwirkung auf den Beutelinhalt, dass die Mischung in kurzer Zeit fertiggestellt ist. Dabei kann die Mischwirkung noch dadurch erhöht werden, dass die Nuten und dementsprechend die Rippen wechselnden Querschnitt und/oder wechselnde Richtung aufweisen, sodass beim Walkvorgang eine Kraftwirkung mit wechselnden Richtungskomponenten auftritt. Die Walkvorrichtung lässt sich leicht an unterschiedliche Mischungsmengen anpassen, wobei zweckmäßig die Walkplatten auswechselbar angeordnet und auch als Wechselplatten mit unterschiedlicher Profilierung auf den beiden Plattenflächen ausgebildet sein können. Die Walkplatten können jedoch auch höhenverstellbare Walkrippen zur Anpassung an verschiedene Mischungsmengen aufweisen.

[0010] Vorteilhafterweise können die Walkplatten mit ihren profilierten Oberflächen aus einem gut wärmeleitenden metallischen Werkstoff gefertigt und gewünschtenfalls heizbar oder kühlbar ausgebildet sein. Die hin- und hergehende Bewegung der Walkplatten kann motorisch mittels herkömmlicher Getriebe oder bei kleineren Vorrichtungen auch von Hand bewirkt werden.

[0011] Mit Hilfe des Beutels lässt sich die gebildete disperse Masse nach dem Walkvorgang rasch und rückstandsfrei in einen Tubenkörper einbringen. Das Einbringen einer pastösen Mischung in einen Tubenkörper mit dem Beutel oder mit anschließendem Abzug des Beutels ist aus dem deutschen Patent 39 27 996 des Anmelders bekannt. Bei Herstellung großer Mengen disperser Systeme in einer industriellen Anlage kann der Beutelinhalt in Abgabegefäße wie Tuben ausgedrückt und der Beutel anschließend mit einer neuen Mischung zur Bearbeitung gefüllt werden.

[0012] Nachfolgend werden Ausführungsbeispiele von Vorrichtungsteilen zur Durchführung des Verfahrens gemäß der Erfindung anhand der beiliegenden Zeichnung näher erläutert.

[0013] Im Einzelnen zeigen:

Fig. 1 eine perspektivische Teilansicht einer Vorrichtung zum Walken der mit den Mischungsbestandteilen gefüllten flexiblen Schlauchbeutel;

Fig. 2 einen Schnitt durch die gegenläufigen Walkplatten der Vorrichtung entlang der Linie II-II in Fig. 1, mit einem zwischen den Walkplatten angeordneten gefüllten Schlauchbeutel;

Fig. 3 eine Teilansicht auf eine Walkplatte mit einem unregelmäßigen Oberflächenprofil;

Fig. 3a, 3b Schnittdarstellungen durch eine Walkplatte mit höhenverstellbaren Walkrippen;

Fig. 4a - 4e Darstellungen weiterer Walkkörper.

[0014] Fig. 1 zeigt einen Teil eines Schenkels eines stationären Vorrichtungsrahmens 10, an dessen Innenseite mit Abstand und parallel zueinander zwei Laufschienen 11 und 12 für kugelgelagerte Laufräder 13 befestigt sind. Die Laufräder, von denen zwei einzeln dargestellt sind, sind zu mehreren an einem oberen Schlitten 14 und an einem unteren Schlitten 15 fliegend gelagert. Die beiden Schlitten 14 und 15 dienen jeweils zur auswechselbaren Aufnahme von einer Walkplatte 16 oder 17 und sind über nicht dargestellte Getriebeteile, beispielsweise über einen einfachen endlosen Kettentrieb, miteinander antriebsmäßig so gekoppelt, dass sie immer eine einander gegenläufige Hin- und Herbewegung ausführen, wie die Pfeile 19 anzeigen. Der Antrieb kann motorisch oder von Hand erfolgen.

[0015] Wie die Schnittdarstellung der Fig. 2 zeigt, begrenzen die beiden parallel zueinander angeordneten Walkplatten 16 und 17 zwischen sich einen Walkspalt 18 und weisen auf ihren den Walkspalt 18 begrenzenden Seiten eine gewellte Oberfläche auf, gebildet durch flache gewölbte Rippen 20, die durch Nuten 21 voneinander getrennt sind und die vorzugsweise quer zu der Verschieberichtung der Walkplatten 16 und 17 verlaufen. Zwischen den Stirnseiten der Rippen 20 ist der Walkspalt 18 am engsten. Die entgegengesetzte Verschieberichtung der beiden Walkplatten 16 und 17 ist durch Pfeile 22 und 23 angedeutet. In dem Walkspalt 18 befindet sich ein mit den Bestandteilen einer zu bildenden dispersen Mischung gefüllter, flachgelegter schlauchförmiger flexibler Kunststoffbeutel 25. Bei der gegenläufigen Bewegung der profilierten, den Walkspalt 18 begrenzenden Oberflächen der beiden Walkplatten 16 und 17 wird der Kunststoffbeutel 25 mit seinem Inhalt rolliert und dabei intensiv gewalkt, sodass in kurzer Zeit eine innig vermischte Masse geschaffen ist.

[0016] Beide Walkplatten 16 und 17 sind als Wendeplatten ausgebildet und auf ihren beiden Seiten mit einer unterschiedlichen Profilierung versehen. Die in Fig. 2 in-

aktive obere Seite der Walkplatte 16 und untere Seite der Walkplatte 17 sind mit schmäleren, stärker gewellten Querrippen 20' und entsprechend mit dazwischenliegenden Nuten 21' ausgebildet als die hier aktiven Seiten der Walkplatten. Die aus Aluminium gefertigten Walkplatten oder die Rippen 20' können mit Kanälen 28 zum Einbringen von Heizpatronen oder zum Hindurchführen eines flüssigen Heiz- oder Kühlmittels versehen sein, wie in Fig. 2 an der Walkplatte 17 gezeigt ist.

[0017] Wie die Teildraufsicht nach Fig. 3 in Richtung des Pfeils III in Fig. 1 auf eine andere Walkplatte 24 zeigt, können die Oberflächen der Walkplatten auch unregelmäßig profiliert sein, beispielsweise mit ihre Richtung, Breite und Tiefe wechselnden Nuten 26 und dementsprechend in ihrer Breite variierenden Rippen 27 versehen sein, wodurch beim Walkvorgang auf das Walkgut nicht nur Kräfte in den Bewegungsrichtungen der Walkplatten, sondern verstärkt auch schräg dazu gerichtete Kraftkomponenten ausgeübt werden. Dadurch lässt sich der Mischvorgang weiter intensivieren und beschleunigen.

[0018] Die Fig. 3a und 3b zeigen zwei Walkplatten 16' und 17', die mit höhenverstellbaren Walkrippen 20' versehen sind. Zur Bearbeitung eines Beutels mit großem Inhalt werden die Rippen 20' weiter ausgefahren und die Platten 16' und 17' in größerem Abstand zueinander bewegt (Fig. 3a) als bei einem Beutel mit nur wenig Inhalt (Fig. 3b). Die höhenverstellbaren Rippen 20' ermöglichen somit die Einstellung des Walkspaltes.

[0019] Die Fig. 4 a bis 4e zeigen weitere Vorrichtungen zum Walken eines Beutels 125. In Fig. 4a (nicht unter die Vorrichtungsansprüche fallend) ist eine Walkplatte 110 dargestellt, mit deren Hilfe der Beutel 125 über eine Grundplatte 111 rolliert wird. Die Walkplatte 110 ist mit Rippen 120 versehen, die ein Durchwalken des Beutelinhalts bewirken. Fig. 4b (nicht unter die Vorrichtungsansprüche fallend) zeigt eine flexible Walkmatte 112, die ebenfalls mit Walkrippen 113 versehen ist. Die Matte 112 wird eingeschlagen und der Beutel 125' dazwischengelegt und durchgewalkt. Die Fig. 4c bis 4e zeigen ein elastisches Walkrohr 115, das auf seiner Innenseite mit einer Anzahl von Walkrippen 116 versehen ist. Der Beutel 125" mit der zu verarbeitenden Mischung wird ins Rohrinnere gelegt. Anschließend wird das Rohr 115 flachgedrückt und über eine Grundplatte 117 bewegt (Fig. 4d). Durch Mitrollieren des Beutels 125" wird dessen Inhalt mittels der Rippen 116 gründlich durchgewalkt. Das Rohr 115 kann auch maschinell bewegt werden, wie aus Fig. 4e ersichtlich ist. Die Maschine 130 weist hierzu ein Antriebsband 131 auf, das das Rohr 115 in Rotation versetzt. An den übrigen Seiten ist das Rohr 115 durch Rollen 132 geführt. Die Richtung des Transportbandes 131 kann dabei umkehrbar sein.

[0020] Falls der Beutelinhalt erwärmt oder abgekühlt werden soll, kann der Beutel in einen mit einer entsprechend temperierten Flüssigkeit gefüllten Beutel gestellt und gemeinsam mit diesem mittels einer der gezeigten Walkvorrichtungen durchgewalkt werden. Der Zusatzbeutel kann jedoch auch einfach parallel zum Beutel mit dem Mischgut durchgewalkt werden und dabei seine Temperatur an das Mischgut abgeben. Außerdem lässt sich ein Zusatzbeutel auch zum Volumenausgleich bei einer unverstellbaren Walkvorrichtung und nur geringer herzustellender Menge eines dispersen Systems einsetzen.

(*) Beispiel: Herstellung einer Wasser-in-Öl-Emulsion.

Wollwachsalkoholsalbe DAB 10	50 g
Wasser	50 g

Rührverfahren:

[0021] Die Wollwachsalkoholsalbe bei 75 °C - 80 °C aufschmelzen (Ölphase) und die auf die gleiche Temperatur erwärmte wässrige Phase unter Rühren hinzufügen. Mit dem Rühren fortfahren, bis eine Temperatur von 25 °C erreicht ist. Zeitaufwand für die Emulgierung ca. 15 Minuten. Zusätzlich wird empfohlen, die Emulsion einige Zeit stehen zu lassen und vor der Abfüllung noch einmal kräftig durchzurühren.

Neues erfindungsgemäßes Verfahren (Walken, Rollieren):

[0022] Mischen der beiden kalten Phasen im Beutel gemäß den Ansprüchen der Erfindung. Emulgierzeit jetzt statt ca. 15 Minuten nur noch 15 Sekunden. Nachträgliches Durchrühren (siehe oben) ist nicht erforderlich und es kann die sofortige, verlustfreie Abfüllung erfolgen (Mischbeutel mit Inhalt in die Tube einsetzen in ca. 15 Sekunden). Dabei leichte in-process- und Endkontrolle. Sind wachsartige Bestandteile enthalten (z. B. Cera flava), so werden diese durch entsprechendes Erwärmen der gesamten Mischung aufgeschmolzen. Danach erfolgt erfindungsgemäß in einem Arbeitsgang das Dispergieren, Suspendieren, Emulgieren und Homogenisieren. Die extrem hohe Dispergierleistung der erfindungsgemäßen Vorrichtungen erlaubt auch ein gleichzeitiges, sehr rasches Abkühlen der Mischung auf 25 °C. Temperaturempfindliche Mischungsbestandteile werden vorzugsweise nachträglich eingearbeitet; ebenso auskristallisierende.

Patentansprüche

1. Verfahren zur Herstellung disperser Systeme, insbesondere Salben, Cremes, Suspensionen, Emulsionen, Gele oder Pasten mittels einer Vorrichtung, **gekennzeichnet durch** folgende Verfahrensschritte:

   a) Einbringen der Mischungsbestandteile in einen flexiblen Beutel unter Einhaltung eines Freivolumens;

b) Verschließen des offenen Beutelendes nach erfolgtem Entfernen von im Beutel befindlicher Luft;

c) Druckbeeinflussung des Beutels und seines Inhalts an wechselnden Stellen und in wechselnden Richtungen **durch** Walken des Beutels, vorzugsweise quer zu seiner Längsachse, wobei der Beutelinhalt zwischen den Innenflächen des Beutels, die entgegengesetzt zueinander bewegt werden, zerrieben wird.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die Beutelfüllung auf maximal 50 % des Beutelvolumens begrenzt ist.

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verschließen des offenen Beutelendes durch Verschweißen des mindestens teilweise aus einem schweißbaren Material gefertigten Beutels oder durch Verknoten erfolgt.

4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Entfernen der Luft aus dem Beutel durch senkrechtes Eintauchen des gefüllten Beutels in Flüssigkeit und Verschließen unterhalb der Flüssigkeitsoberfläche oder durch Ausstreifen des Beutels von unten nach oben, vorzugsweise bei senkrechter Haltung des Beutels, erfolgt.

5. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Entfernen der Luft aus dem Beutel durch Ausstreifen erfolgt.

6. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die Druckbeeinflussung des Beutels und seines Inhalts durch Walken wahlweise

mittels einer Walkplatte, mit der der Beutel über eine vorzugsweise mit einer haftenden Oberfläche versehene Unterlage gerollt wird,

oder mittels einer Walkmatte, in die der Beutel eingelegt wird,

oder mittels eines elastischen Walkrohrs, das sich flächig zusammendrücken lässt und in das der Beutel eingelegt wird,

oder mittels gegenläufig zueinander bewegbaren profilierten Flächen, zwischen die der Beutel eingelegt wird,

erfolgt.

7. Verfahren nach Anspruch 1 oder 6, **dadurch gekennzeichnet, dass** der Beutel nach erfolgter Druckbeeinflussung mittels einer Trennschweißvorrichtung in einzelne verschlossene Portionsbeutel unterteilt wird.

8. Verfahren nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** anschließend an die Druckbeeinflussung des Beutels und seines Inhalts die fertige Mischung im Beutel oder ohne Beutel in ein Speicher- oder Entnahmegefäß eingebracht wird.

9. Verfahren nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** es vielfach bei Raumtemperatur durchführbar ist.

10. Verfahren nach einem der Ansprüche 1 bis 9, **dadurch gekennzeichnet, dass** es zur Herstellung kleiner Mengen disperser Systeme oder in Prozessanlagen zur Herstellung großer Mengen disperser Systeme einsetzbar ist.

11. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** in Prozessanlagen parallel zueinander verschiedene disperse Systeme herstellbar sind.

12. Vorrichtung zur Durchführung von Verfahrensschritten nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** sie eine Vorrichtung zum Walken des Beutels (25) aufweist, bei welcher in einem starren Rahmen (10) mindestens ein Paar miteinander zusammenwirkender Walkplatten (16, 17) mit profilierter Oberfläche parallel und entgegengesetzt zueinander verschiebbar gelagert sind, die auf ihren einander zugewandten Flächen mit überwiegend quer zu der Verschieberichtung (19, 20, 23) verlaufenden kantenfreien gewölbten Rippen (20, 20') versehen sind, zwischen denen Nuten (21, 21') ausgebildet sind.

13. Vorrichtung nach Anspruch 12, **dadurch gekennzeichnet, dass** die Nuten (26) und dementsprechend die Rippen (27) der Walkplatten (24) wechselnden Querschnitt und/oder wechselnde Richtungen aufweisen.

14. Vorrichtung nach Anspruch 12 oder 13, **dadurch gekennzeichnet, dass** die Walkplatten (16, 17) im verfahrbaren Schlitten (14, 15) auswechselbar angeordnet und auf beiden Seiten mit einer unterschiedlichen Profilierung versehen sind.

15. Vorrichtung nach einem der Ansprüche 12 bis 14, **dadurch gekennzeichnet, dass** die Walkplatten (16, 17, 24) mit ihren profilierten Oberflächen aus einem metallischen Werkstoff gefertigt sind.

16. Vorrichtung nach einem der Ansprüche 12 bis 15, **dadurch gekennzeichnet, dass** der Abstand der

Walkplatten (16, 17) und die Höhe der Rippen (27) verstellbar sind.

17. Vorrichtung zur Durchführung von Verfahrensschritten nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** sie ein elastisches, auf der Innenseite mit Walkrippen versehenes Rohr (115), in das der Beutel (125") einlegbar ist, aufweist.

18. Vorrichtung nach Anspruch 17, **dadurch gekennzeichnet, dass** das Walkrohr von einer Maschine betätigbar ist, wobei ein permanentes Drehen des Rohrs unter gleichzeitiger Druckausübung entweder in einer Richtung oder in wechselnden Richtungen erfolgt.

19. Vorrichtung nach einem der Ansprüche 12 bis 16 oder 18, **dadurch gekennzeichnet, dass** mindestens eine Walkplatte, heizbar oder kühlbar ausgebildet ist

Claims

1. Method of producing dispersed systems, in particular ointments, creams, suspensions, emulsions, gels or pastes, by means of an apparatus, **characterized by** the following procedural steps:

   a) Placing the constituents of the mixture into a flexible bag, whilst preserving a free volume;

   b) Sealing the open end of the bag after removing air from the bag;

   c) Applying pressure to the bag and its contents at various points and in different directions by squeezing the bag, preferably at right angles to its longitudinal axis, the contents of the bag being crushed between the inner surfaces of the bag as they are moved against one another.

2. Method according to Claim 1, **characterized in that** filling of the bag is limited to a maximum of 50% of the bag's volume.

3. Method according to Claim 1, **characterized in that** the open end of the bag is sealed by welding the bag, which is made at least partly of a weldable material, or by tying a knot in it.

4. Method according to Claim 1, **characterized in that** air is removed from the bag by vertically immersing the filled bag into liquid and sealing it below the surface of the liquid, or by pressing the bag from the bottom to the top, preferably whilst holding the bag vertical.

5. Method according to Claim 1, **characterized in that** the air is removed from the bag by pressing it out.

6. Method according to Claim 1, **characterized in that** the bag and its contents are subjected to pressure either by squeezing them

   by means of a pressing plate, with which the bag is rolled over a supporting base which is preferably provided with an adhesive surface,

   or by means of a pressing mat into which the bag is placed,

   or by means of a flexible pressing tube, which can be pressed flat and into which the bag is inserted,

   or by means of profiled surfaces, which can move in opposite directions to one another, between which the bag is placed.

7. Method according to Claim 1 or 6, **characterized in that**, after the application of pressure, the bag is divided into individual sealed portion bags by means of a separating welding apparatus.

8. Method according to one of Claims 1 to 7, **characterized in that**, after the application of pressure to the bag and its contents, the finished mixture is placed, in the bag or without the bag, in a storage container or other container designed for its supply.

9. Method according to one of Claims 1 to 8, **characterized in that** it can frequently be carried out at room temperature.

10. Method according to one of Claims 1 to 9, **characterized in that** it can be used for producing small quantities of dispersed systems or else for producing large quantities of dispersed systems in processing installations.

11. Method according to Claim 10, **characterized in that**, in processing installations, different dispersed systems can be produced concurrently.

12. Apparatus for carrying out the procedural steps according to one of Claims 1 to 11, **characterized in that** it comprises means for squeezing the bag (25), in which at least one pair of co-operating pressing plates (16, 17) with profiled surfaces are mounted in a rigid framework (10), in such a way that they can move parallel to one another and in opposite directions to one another, said pressing plates (16, 17) being provided on their surfaces facing one another with smoothly curved ribs (20, 20'), which mainly run at right angles to the direction of dis-

placement (19, 20, 23), and with channels (21, 21') formed therebetween.

13. Apparatus according to Claim 12, **characterized in that** the channels (26) and consequently the ribs (27) of the pressing plates (24) have varying cross-sections and/or run in different directions.

14. Apparatus according to Claim 12 or 13, **characterized in that** the pressing plates (16, 17) are detachably mounted in the travelling slide (14, 15) and are provided with a different profiling on each of their two sides.

15. Apparatus according to one of Claims 12 to 14, **characterized in that** the pressing plates (16, 17, 24) with their profiled surfaces are made of a metal material.

16. Apparatus according to one of Claims 12 to 15, **characterized in that** the distance between the pressing plates (16, 17) and the height of the ribs (27) can be adjusted.

17. Apparatus for implementing the procedural steps according to one of Claims 1 to 11, **characterized in that** it comprises a flexible tube (115), provided on the inside with pressing ribs, into which the bag (125") can be placed.

18. Apparatus according to Claim 17, **characterized in that** the pressing tube can be operated by a machine, the tube being turned continuously with simultaneous application of pressure either in one direction or in different directions.

19. Apparatus according to one of Claims 12 to 16 or 18, **characterized in that** at least one pressing plate is designed so that it can be heated or cooled.

Revendications

1. Procédé de fabrication de systèmes dispersés, en particulier de pommades, crèmes, suspensions, émulsions, gels ou pâtes, au moyen d'un dispositif, **caractérisé par** les étapes de procédé suivantes :

   a) introduction des ingrédients du mélange dans une poche souple en réservant un volume vide ;

   b) fermeture de l'extrémité ouverte de la poche après évacuation de l'air se trouvant dans la poche ;

   c) sollicitation en pression de la poche et de son contenu en des endroits alternés et dans des directions alternées par foulage de la poche, de préférence transversalement à son axe longitudinal, le contenu de la poche étant trituré entre les surfaces intérieures de la poche, lesquelles sont déplacées dans des directions opposées l'une par rapport à l'autre.

2. Procédé selon la revendication 1, **caractérisé en ce que** le remplissage de la poche est limité à 50 % au maximum du volume de la poche.

3. Procédé selon la revendication 1, **caractérisé en ce que** la fermeture de l'extrémité ouverte de la poche s'effectue par soudage de la poche fabriquée au moins partiellement en matériau soudable ou par nouage.

4. Procédé selon la revendication 1, **caractérisé en ce que** l'évacuation de l'air hors de la poche s'effectue en plongeant verticalement la poche remplie dans du liquide et en fermant au-dessous de la surface du liquide ou en aplatissant la poche de bas en haut, de préférence en maintenant la poche verticalement.

5. Procédé selon la revendication 1, **caractérisé en ce que** l'évacuation de l'air hors de la poche s'effectue par aplatissement.

6. Procédé selon la revendication 1, **caractérisé en ce que** la sollicitation en pression de la poche et de son contenu par foulage s'effectue au choix

   au moyen d'une plaque de foulage, avec laquelle la poche est roulée sur un support de préférence pourvu d'une surface adhérente,

   ou au moyen d'un tapis de foulage dans lequel la poche est insérée,

   ou au moyen d'un tube élastique de foulage qui peut être comprimé à plat et dans lequel la poche est insérée,

   ou au moyen de surfaces profilées mobiles en sens contraire les unes par rapport aux autres, entre lesquelles la poche est insérée.

7. Procédé selon la revendication 1 ou 6, **caractérisé en ce que**, à l'issue de la sollicitation en pression, la poche est divisée en poches portionnées fermées individuelles au moyen d'un dispositif de séparation-soudage.

8. Procédé selon l'une des revendications 1 à 7, **caractérisé en ce que**, après la sollicitation en pression de la poche et de son contenu, le mélange fini, dans la poche ou sans poche, est introduit dans un

récipient de stockage ou de prélèvement.

9. Procédé selon l'une des revendications 1 à 8, **caractérisé en ce qu'**il est réalisable à de multiples reprises à température ambiante.

10. Procédé selon l'une des revendications 1 à 9, **caractérisé en ce qu'**il peut être mis en oeuvre pour fabriquer de petites quantités de systèmes dispersés ou, dans des installations de traitement, pour fabriquer de grandes quantités de systèmes dispersés.

11. Procédé selon la revendication 10, **caractérisé en ce que** différents systèmes dispersés peuvent être fabriqués parallèlement les uns aux autres dans des installations de traitement.

12. Dispositif pour la mise en oeuvre d'étapes du procédé selon l'une des revendications 1 à 11, **caractérisé en ce qu'**il comporte un dispositif pour le foulage de la poche (25), dans lequel au moins une paire de plaques de foulage (16, 17) à surfaces profilées coopérant entre elles sont logées dans un cadre fixe (10) de manière parallèle et mobile dans des directions mutuellement opposées, lesdites plaques de foulage étant pourvues, sur leurs surfaces en vis-à-vis, de nervures bombées sans arête (20, 20') qui s'étendent pour l'essentiel transversalement à la direction de déplacement (19, 20, 23) et entre lesquelles sont ménagées des rainures (21, 21').

13. Dispositif selon la revendication 12, **caractérisé en ce que** les rainures (26) et donc les nervures (27) des plaques de foulage (24) ont des sections transversales alternées et/ou des directions alternées.

14. Dispositif selon la revendication 12 ou 13, **caractérisé en ce que** les plaques de foulage (16, 17) sont disposées de manière échangeable dans des chariots mobiles (14, 15) et sont pourvues, des deux côtés, de profilages différents.

15. Dispositif selon l'une des revendications 12 à 14, **caractérisé en ce que** les plaques de foulage (16, 17, 24) sont fabriquées avec leurs surfaces profilées en un matériau métallique.

16. Dispositif selon l'une des revendications 12 à 15, **caractérisé en ce que** l'écartement des plaques de foulage (16, 17) et la hauteur des nervures (27) sont réglables.

17. Dispositif pour la mise en oeuvre d'étapes du procédé selon l'une des revendications 1 à 11, **caractérisé en ce qu'**il comporte un tube élastique (115) pourvu de nervures de foulage sur le côté intérieur et dans lequel la poche (125") peut être insérée.

18. Dispositif selon la revendication 7, **caractérisé en ce que** le tube de foulage peut être actionné par une machine, une rotation permanente du tube s'effectuant en même temps qu'une pression est exercée soit dans une direction soit dans des directions alternées.

19. Dispositif selon l'une des revendications 12 à 18 ou 18, **caractérisé en ce qu'**au moins une plaque de foulage est conçue pour être chauffée ou refroidie.

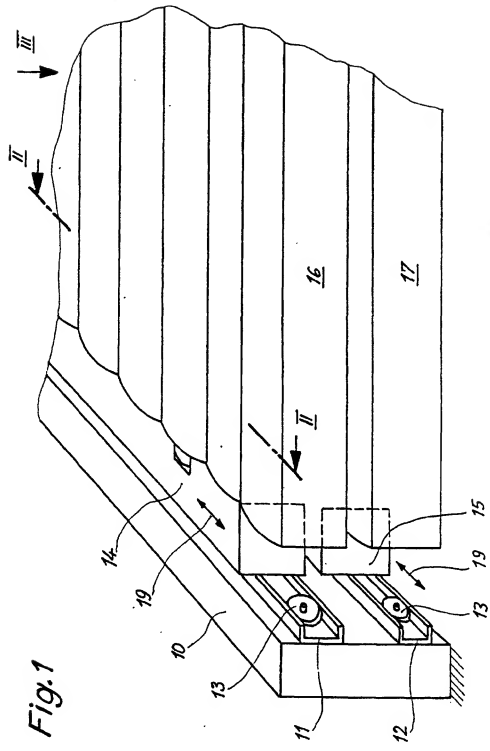


Fig.1

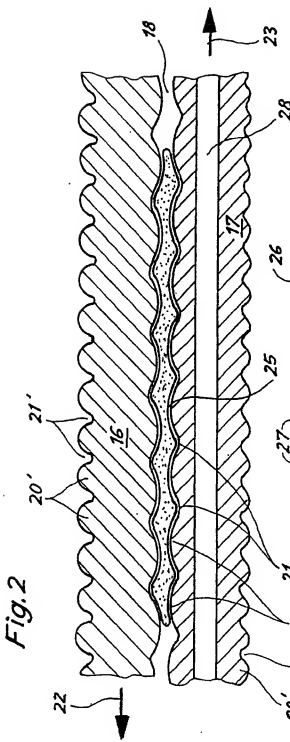


Fig.2

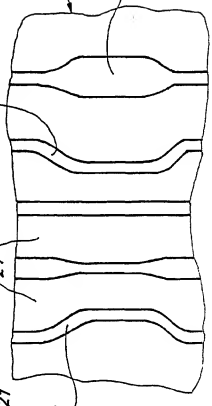
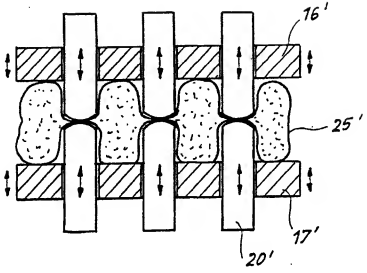


Fig.3

Fig.3a



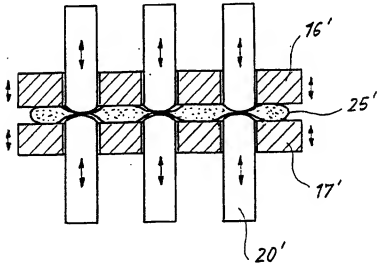


Fig.3b

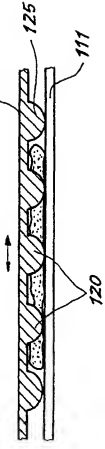


Fig. 4a

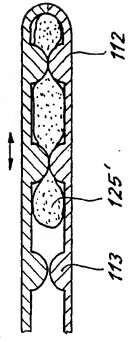


Fig. 4b

Fig.4c

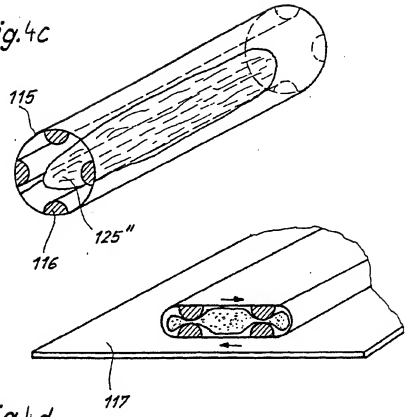


Fig.4d

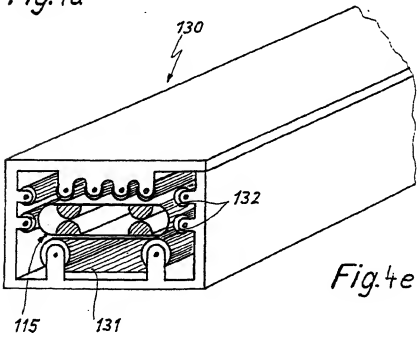


Fig.4e

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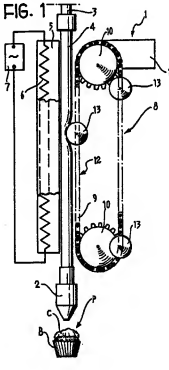
(54) Apparatus for the controlled supply of products, for example foodstuffs

(57) The apparatus includes a tube (4) which can be deformed in the sense that it can be squashed and into which is fed (3) the product to be delivered. A presser unit (8) cooperates with the flexible tube (4), which extends in a generally straight line, and can squash the tube (4) so as to reduce its internal passage and can subsequently cause the translational movement of the squashed zone along the tube (4). The translational movement of the squashed zone results in a nett expulsion of the mass from the tube. The preferred application is for the delivery of metered quantities of creamy substances such as chocolate, cream and other aerated food products.

FIG. 1



EP 0 713 081 A1

Description

The present invention relates to apparatus for the controlled supply of products.

The invention has been developed with particular concern for its possible use for the controlled supply of foodstuffs, such as masses of creamy food products. Typical examples of substances of this type are, for example, chocolate cream, whipped cream (or substantially similar creams), mayonnaise, foamed products, etc. very often one is concerned with aerated masses, that is, masses which contain greater or lesser quantities of gases trapped within them (usually air although obviously the term "aerated" should not be understood as limited strictly to the presence of air).

Apparatus for delivering metered supplies of aerated substances such as foams is described for example in European Patent Application EP-A-0539646. In this prior art document the problem specifically faced is that of delivering very small metered quantities of aerated substances, such as, indeed, foamed products. One is concerned in this case with an aerated substance having a very low specific gravity and marked characteristics of elastic compressibility due to the mass of trapped gas. In the prior-art document in question, in which particular emphasis is placed on the problem of precision metering given the very small quantity of foam handled at any one time, it has already been made clear that it is necessary to handle aerated substances, so to speak, delicately, without the application of mechanical stresses or pressures which could damage the mass, for example by making it "fall".

The present invention, the field of application of which is not, however, limited solely to the food product sector, takes its starting point from the need to satisfy several concurrent and complementary requirements in addition to the requirements which are at the root of the solution described in EP-A-0539646. This is true particularly with regard to the need to supply relatively large quantities of substances very quickly (which requirement is particularly critical in modern plants for the manufacture of food products which operate at very high rates) and the need to produce apparatus which can be cleaned easily and, if necessary, sterilised, and the need to prevent any stagnation of masses of the substances delivered.

The object of the present invention is to achieve solutions which are able to satisfy even these further requirements in an excellent manner.

According to the present invention, this object is achieved by apparatus having the characteristics claimed specifically in Claim 1. Advantageous developments of the invention form the subjects of the subclaims 2 to 31.

In summary, the present invention provides for the product to be delivered to be fed into a straight tube with a flexible wall. This wall is then squashed, with the subsequent translational movement of the squashed zone along the length of the tube. The translational movement of the squashed zone causes a force to be exerted on the substance in the tube with its resultant delivery from the tube itself.

The invention may thus be considered as operating on the principle of so-called peristaltic pumps. Such pumps are generally available commercially for various uses (usually for pumping liquids, including biological liquids in blood purification systems, etc) and include a tube into which the liquid intended to be pumped is fed. The tube is arranged in an arcuate path, typically circular, within a cylindrical stator. A lobed rotor is mounted in the cylindrical stator and its rotation causes the ordered squashing of the wall of the flexible tube and the consequent pumping action.

Experiments carried out by the Applicant have, however, shown that the use of conventional peristaltic pumps in the preferred field of application of the present invention (supply of food products which may be aerated) gives rise to considerable operational problems such as the blocking of the pump lines and damage to the products pumped. The reasons for this unsatisfactory behaviour are not at all clear: it must, however, be assumed that the problem with conventional peristaltic pumps is that they apply mechanical stresses and pressures to the substance pumped which are in fact incompatible with the handling of substances with a degree of viscosity (for example creams) and/or aerated substances of the type described in the introduction to the present invention, despite the fact that they can be withstood without serious disadvantages by a mass with little viscosity and/or masses which are substantially incompressible, such as liquids.

The invention will now be described purely by way of non-limitative example with reference to the appended drawings, in which:

Figure 1 illustrates the basic structure of apparatus according to the invention,

Figure 2 illustrates one embodiment of the solution of the invention, and

Figure 3 illustrates schematically the internal structure of one of the elements illustrated in Figure 2.

The delivery apparatus generally indicated 1 in Figure 1 is intended to be used, for example, for the controlled delivery of a food product such as, for example, chocolate cream or a like cream.

As is well known to experts in the field, the correct handling of chocolate imposes very stringent requirements such as, for example, the need to keep the mass at a strictly controlled temperature in order to avoid harmful phenomena (separation of butter, etc) and, above all, to enable the mass of chocolate to be cooled properly by the process generally known as "tempering".

By way of example, the delivery apparatus of Figure 1 may be used to form decorations constituted by lines of chocolate deposited on products such as, for example, spherical pralines P in respective paper cups B with a top coating C.

For example, one may be dealing with products such as those indicated in EP-A-0554707 where the possibility of forming the coating C by spraying is illustrated. Naturally, one is considering purely an example, in that - as already specified - the invention lends itself to numerous other applications, even outside the food sector.

In the case illustrated here by way of example, the creamy mass (for example chocolate) which is metered is deposited in the form of decorative lines from a nozzle 2 (of known type) located at the lower end of the delivery apparatus 1. The apparatus 1 receives the mass to be delivered through a feed line of which only the end part is shown indicated 3 in Figure 1. This feed line is also well known in the art and does not therefore need to be explained herein specifically.

Turning to the decoration of the products P, it has been stated that the decorations are usually in the form of lines of creamy material deposited on the products P in selected, predetermined paths. This is achieved by causing relative movement between the nozzle 2 and the product P while the creamy mass is delivered through the nozzle 2. The relative movement may be achieved either by holding the nozzle 2 stationary (usually in an array of several nozzles arranged, for example, in a row) and moving the product P, for example by the simple translational movement of a conveyor on which the products P are located, or by moving the nozzle or nozzles 2 (by means not specifically illustrated in the drawings) in a given path relative to the products P which are kept stationary. Naturally, it is also possible to combine a movement of the products P (for example a translational movement of the conveyor on which they are located) with a movement (for example zig-zag) of the nozzle or nozzles 2.

The core of the delivery apparatus 1 is a tube 4 which connects the output end 3 of the feed line to the delivery nozzle 2. One is concerned with a flexible-walled tube (which can thus be squashed) which extends in a substantially straight path of a given length.

This length is not in itself critical for the purposes of the invention. This length, together with the section of the tube 4 and the travel of the pressor element of which more will be said below, determines the volume of the mass to be delivered. In solutions which have been shown to be most advantageous up until now, the length of the tube 4 - with reference to the embodiment illustrated in Figure 1 - is of the order of 20-40cm.

Tests carried out by the Applicant have also shown that it is preferable, in use, for the tube 4 to be held vertically or substantially vertically (in the sense that displacements from the vertical even of a certain magnitude do not have an appreciably harmful effect on the operation of the apparatus).

The tube 4 extends immediately adjacent, preferably in at least marginal contact, with an abutment element 5 illustrated here in the form of a plate.

As will be more fully explained below, the function of the abutment plate 5 is essentially that of forming a plane against which the flexible tube 4 may be pressed. Consequently, any structure of rigid material (even a grid or perforated structure) is suitable for this purpose. The choice of the material from which the abutment element 5 is made is not critical as long as the required rigidity is ensured. However, in an embodiment which has been shown to be preferential, the abutment element 5 is made from a thermally conductive material (such as metal) and/or carries associated thermal-conditioning elements (heating and/or cooling) which are shown schematically in the form of an electrical heating resistor 6 powered through a respective thermostated unit 7.

Naturally, the use of a resistor as the heating element is not essential: equivalent means such as coils for the passage of diathermic fluids etc are clearly within the scope of an expert in the field, particularly when it is wished to achieve cooling instead of, or in addition to, heating.

On the opposite side of the flexible tube 4 from the abutment element 5 is a presser assembly 8 constituted (in the embodiment illustrated in Figure 1) by a chain 9 which passes over two wheels or pulleys 10, one of which is driven by a motor 11. The pulleys 10 are located one at the lower end and one at the upper end of the tube 4 so as to present an "active" pass 12 which extends along at least part of the length of the tube 4.

Rollers 13 are mounted on the chain 9, preferably equidistant from each other, and, when they are adjacent the active pass 12 of the chain 9, they act on the tube 4 to squash it against the abutment element 5.

With reference to the point of observation of Figure 1, the motor 11 drives the pulleys 10 to rotate in the anticlockwise sense, whereby the active pass 12 of the chain 9 and the rollers 13 thereon move downwardly.

The degree of squashing of the tube 4 (which, in the simplest embodiment, is constituted by a tube of elastomeric material, for example an elastomer which is compatible with contact with food products) may be adjusted by the selection of the radius of the rollers 13 and/or by varying selectively the position of the active pass 12 of the chain and possibly of the presser unit 8 as a whole relative to the tube 4 and the abutment element 5. The squashing of the tube 4 may thus be regulated selectively starting from a maximum value (in which the deformation induced in the wall of the tube 4 is such as to cause the complete closure of the duct within the tube itself) to a lesser value in which the duct within the tube 4 is reduced but not completely closed.

In each case, as a result of the rotation of the pulleys 10 and the consequent movement of the chain 9, each roller 13 periodically travels a downward path along and against the tube 4 with the consequent formation of a squashed zone at the upper end of the tube 4 (which is more or less marked as explained above). Still as a result of the downward movement of the active pass 12 of the chain 9, the zone of the tube 4 squashed by the roller 13 moves gradually towards the lower end of the tube 4 and is then annulled when the roller which is involved in the squashing at the time moves away from the tube 4 dis-

engaging it as a result of its movement around the lower pulley 10.

The wall of the tube 4 is thus subjected to a deformation phenomenon which can be likened essentially to a sort of peristaltic movement.

Consequently the product (for example a cream) which is fed into the tube 4 through the line 3 is urged gradually towards its lower end, that is, towards the nozzle 2, until it is delivered through this nozzle.

The dynamics of this delivery and, in general, the dynamics of the descent of the delivered product through the tube 4, are rather complicated. As a result of the vertical, or substantially vertical, orientation of the tube 4, the product in question is subject to the force of gravity. In most cases, the force of gravity is not sufficient to cause the nett descent of the product through the tube 4. Usually the diametral dimensions of the tube 4 (generally no greater than 1-2 cm), depending on the degree of viscosity of the mass (it will be remembered that, in most cases, one is dealing with a creamy substance such as chocolate, cream or the like), in practice result in effects in the tube 4 very similar to capillarity. The same considerations naturally also apply to very fluid masses when the diameter of the tube 4 is correspondingly reduced. Briefly, the thrust exerted by the presser unit 8 on the mass in the tube 4 can thus be likened to the thrust which is achieved when a creamy mass is delivered from a tube such as a toothpaste tube or a tube of mayonnaise, which is squashed while the delivery aperture is held downwards.

The delivery of the product from the nozzle 2 is thus not achieved in a continuous manner but, generally speaking, in waves, with each wave corresponding to the descent of a roller 13 along the tube 4. The result of this is that it is possible to control the quantity of product delivered in each wave by varying the length of travel of each roller along the tube 4. A further metering action may also be achieved by increasing or reducing the magnitude of the squashing of the tube 4 achieved by the rollers 13. It will be noted, in particular, that the magnitude of this squashing is also correlated to the degree of pressure which it is possible to establish in the mass supplied to the nozzle 2.

The fact that delivery does not occur continuously lends itself ideally - as indicated previously - to its possible use for the decoration of products P. It is, in fact, possible to operate in such a manner that each delivery wave corresponds to the formation of the decoration on a respective product P. The pause between two successive waves - the duration of which can be adjusted selectively by varying the speed of the chain 9 and/or varying the distance between the rollers 13 on the chain 9 itself, may be used to move the delivery nozzle 2 to another product to perform the next decorating operation. As already indicated above, the fact that the abutment element 5 includes a heating/cooling element which extends along the entire length of the tube 4, or along an appreciable part thereof (thus in immediate proximity to, and in heat-exchange relationship with, the products being delivered, through the wall of the tube 4) has the advantage of enabling the temperature of the product delivered to be regulated precisely.

Figure 2 illustrates a possible variant of the delivery apparatus of Figure 1 with reference to a structure which has been shown to be particularly advantageous for the delivery of aerated substances such as whipped cream or like creamy foodstuff, for example milk-based creams.

In Figure 2 the elements already described with reference to Figure 1 - or elements equivalent thereto - have been indicated by the same reference numbers as used previously.

The solution of Figure 2 is used - for example - to supply a milk-based cream (substantially like whipped cream - hence an aerated foodstuff) into individual food products constituted by elongate wafer half-shells S which are generally boat-shaped with a length of the order of 5-6cm.

For this purpose the foodstuff in question is supplied simultaneously into a given number of individual products S, for example six products arranged in a row in a direction perpendicular to the plane of the drawings.

To this end a corresponding number of flexible tubes 4 (six tubes 4) is used, each of which supplies a corresponding nozzle 2 at its lower end. In the specific example shown in Figure 2, each nozzle 2 has a delivery aperture 2a constituted by a straight slit having a length of several centimetres and intended to be located above, and facing, a product S.

In the solution of Figure 2, the outlet end 3 of the feed line, as will be better understood below, has the structure of a manifold at which terminate a plurality (six, with reference to the embodiment illustrated in which there are six flexible tubes 4) of connector ducts 14 coming from a distributor 15 with an associated thermal-conditioning element (heater/cooler) 16 controlled by a thermostated unit 17.

The distributor 15 is in turn supplied through a pressure regulator 18 (of known type) to which the mass to be delivered is fed through a supply line 19 (terminating at a source not illustrated).

The pressure regulator 18 has a vent line 20 which opens into an exhaust space 21.

The function of the distributor 15 is essentially to distribute the mass to be delivered to the various tubes 4 as uniformly as possible so as to make the delivery conditions in which the various nozzles 2 operate exactly the same.

As best illustrated in Figure 3 (which is obviously of schematic character), the distributor 15 is usually constituted by a solid piece of thermally conductive material such as metal in which there are ducts or flow passages such as to give the distributor 15 the character of a static distributor of generally conic shape. The supply line indicated 22 from the pressure regulator 18 enters the distributor 15 at the vertex of this shape, usually at the top.

The supply line 22 branches into a plurality of distributor lines 23, the number of which corresponds to the number of connector ducts 14 (six in the embodiment

illustrated) intended to supply the tubes 4 of the delivery apparatus 1.

As clearly visible in figure 3, the distributor lines 23 diverge from the supply line 22 along the generatrices of the conical shape of the distributor 15 so as to terminate each at one of the connector ducts 14.

The element 16 can thus be located in the body of the distributor 15 (as shown schematically in broken outline in Figure 3), in a central position equidistant from, and symmetrical with respect to, all the ducts 23 so as to act identically on all the lines of flow defined by these ducts.

By locating the distributor 15 in a position overlying, and centred on, the manifold 3 which is connected to the connector ducts 14 (preferably also made of plastics material, if necessary compatible with the handling of food materials and selected so as all to have the same length), it is possible to divide the substance to be delivered, which flows into the distributor 15 through the inlet line 22, into a given number of paths or branches (six in the embodiment illustrated) so as to flow on to the respective tubes 4. All these flows have exactly the same length of passage whatever the path or branch followed and thus the flows passing through the manifold 3 and reaching the upper ends of the tubes 4 have exactly the same flow rate and pressure in all the paths or branches of the distributor. This fact, together with the manner in which the tubes 4 are squashed, ensures that the delivery conditions for the various nozzles 2 are exactly the same as for all the other nozzles.

The solution shown in Figure 2 also provides for the use of rollers 13 to squash the flexible tubes 4.

In the solution of Figure 2, the manner in which the rollers 13 are driven differs slightly from that adopted in the solution of Figure 1.

It goes without saying that, at least in principle, the structure of the presser unit 8 explained previously with reference to Figure 1, may be used in the arrangement of Figure 2 and vice versa.

Essentially the solution referred to in Figure 2 provides for the use of at least one roller 13 which can press not just one tube 4 but, in general, a plurality of tubes 4 (hence two or more) placed side by side. Naturally it is understood that this solution, although preferred, is not essential. It is in fact possible to provide as many presser units as there are tubes even if several tubes 4 are located side by side.

The axis of the roller 13 thus extends transverse the length, which is substantially vertical, of the adjacent tubes 4 and is supported at one end of its axis of rotation (or possibly at both ends if this is preferred for reasons of stability) by the shaft 28 of an actuator 29 which extends generally alongside the tubes 4. In the embodiment illustrated, the actuator 29 is mounted on the same side of the tubes 4 as the abutment element 5. Naturally it would also be possible to use a complementary arrangement with the actuator 29 located on the same side (opposite that of the abutment element 5) as the roller 13.

The function of the actuator 29 is essentially that of moving the roller between a position in which it is effectively disengaged from the tube 4 (for example a position of marginal contact in which the roller 13 does not exert any appreciable pressure on the wall of the tube 4, as illustrated in full outline in Figure 2) and a squashing position in which the roller 13 compresses the wall of the tube 4, deforming it in the sense of squashing it (as illustrated in broken outline in the same Figure 2).

As already explained in full with reference to the embodiment of Figure 1, the degree of squashing of the wall of the tube 4 may be adjusted selectively, for example by varying the travel of the shaft 28 of the actuator 29 correspondingly or, in general, by varying the assembly position of the actuator 29 relative to the tube 4 or, yet again - if wished - by replacing the roller 13 by a roller of a different diameter.

As shown schematically in the drawing, the actuator 29 is mounted on a structure 30 which extends alongside the tubes 4. More specifically, the actuator 29 is mounted so as to be slidable on vertical guides 31 carried by the structure 30 and is acted upon by a further actuator 32 which extends vertically and acts between the structure 30 and the actuator 29 to make this slide vertically on the guides 31.

Supposing that one starts from the position illustrated in full outline in Figure 2, in which the actuator 29 is at the upper end of the guide 31 (actuator 32 with shaft 32a retracted), it is possible (under the control of a control device not illustrated and of known type such as a PLC) to drive a cyclic operative sequence which includes the following steps:

- return of the shaft 28 into the actuator 29 sufficiently to bring the roller 13 into a position in which it squashes the tube 4 (position illustrated in broken outline in Figure 2),
- activation of the actuator 32 with corresponding extension of the shaft 32a out of the actuator 32 itself and descent of the actuator 29 along the guides 31 until it reaches the position illustrated in chain line in Figure 2; this downward movement corresponds to the translational movement of the roller 13, which keeps the wall of the tube 4 squashed, with the consequent delivery of the mass flowing through the tube 4 in a manner wholly similar to that described previously with reference to the embodiment of Figure 1.
- stoppage of the movement of the actuator 29 along the guides 31 at a lower position predetermined selectively in accordance with the quantity of substance to be delivered through the nozzles 2, as shown schematically in chain line in Figure 2,
- activation of the actuator 29 in the sense which causes the extension of the shaft 28 and consequent movement of the roller 13 into its position of disen-

gagement (absence of squashing) from the tube 4, as shown schematically in the double-dotted chain line in Figure 3, and

- further activation of the actuator 32 in the sense of returning the shaft 32a into the actuator 32 itself, with the resulting return of the actuator 29 and of the roller 13 carried thereby to the starting position illustrated in full outline in Figure 2.

The cyclic repetition of the sequence of steps described above causes the foodstuff to be delivered from the line 19 through the nozzles 2 into the products S in "waves", that is to say, in a manner substantially similar to that described previously with reference to the embodiment of Figure 1.

In the embodiment of figure 3 , there is the further possibility of making use of a roller and actuator mechanism for fulfilling a function which can be likened essentially to that of a valve or tap which further controls the delivery through the nozzles 2 so as to avoid any undesirable dropping of substance from the nozzles 2 themselves.

Specifically, in the embodiment illustrated, a further actuator 33 is mounted on the structure 30 beneath the lower end of the guides 31, and thus adjacent the lower end or ends of the flexible tube or tubes 4, the shaft 33a of this actuator extending horizontally. The shaft of the actuator 33 carries a further roller 34 at its free end in a manner substantially similar to that adopted for the mounting of the roller 13 on the shaft 28 of the actuator 29, this further roller 34 being able to squash the lower end or ends of the tube or tubes 4.

The roller 34 differs from the roller 13 in that, whereas the latter can move horizontally into its position in which it squashes the tube 4 and also vertically as a result of the vertical movement of the actuator 29 along the guides 31 to effect delivery, the roller 34 moves solely horizontally. More precisely, the roller 34 is moved - as a result of the activation of the actuator 33 - between the position illustrated in full outline in Figure 2, in which the roller 34 is disengaged from the tube 4 or bears on its lower end without squashing it, and the position illustrated in broken outline in the same drawing in which, as a result of the return of the shaft 33a into the actuator 33, the roller 34 is moved into a position in which it squashes the tube 4 - generally completely or nearly completely - with the resulting closure of the passage therethrough.

The movement of the roller 34 into the squashing position - hence closure - of the tube 4 is controlled by the PLC which controls the activation of the actuators 29 and 32 in a manner coordinated with the downward travel of the roller 13 which squashes the tube 4 and causes the delivery of the foodstuff through the nozzle 2. More particularly, when the roller 13 descends so as to cause the delivery through the nozzles 2, the roller 34 is kept in its position in which it is disengaged from the tube 4 and is then moved into its engaged, squashing position when the delivery travel of the roller 13 has been completed and the roller 13 itself has been moved away from the tube 4 and back up to its starting position. In these conditions, the roller 34 squashes the tube 4 and, more particularly, its lower end so as to close the passage through it and thus prevent undesirable quantities, however small, of the foodstuff which flows through the tube 4 from being delivered through the nozzle 2. This solution (or the provision of equivalent tap-means at the lower end of the tube 4) is a preferred choice when the substance to be delivered through the tubes 4 is rather fluid and thus able to fall through the tubes 4 even when not urged by the roller 13. Naturally, the principle of the invention remaining the same, the constructional details and forms of embodiment may be varied widely with respect to those described and illustrated without thereby departing from the scope of the present invention. This is true particularly with regard to the structure of the presser unit 8. Even though in both solutions described with reference to Figures 1 and 2, the unit is based on the use of profiled bodies constituted by rollers, it is naturally understood that the invention can be carried out with technically equivalent solutions in which the element which can press on the flexible tube 4 and subsequently move the compressed zone along the tube 4 itself may be constituted by squashing means of a different nature, such as a sliding block or a cursor.

Claims

1. Apparatus for the controlled delivery of a product characterised in that it comprises:

   a tube (4), which is flexible in the sense that it can be squashed, extending in a substantially straight path and able, in use, to receive (3) a substance to be delivered and

   a presser unit (8) including squashing means (13) which can cooperate with the tube (4) to squash a given zone of the tube (4) with subsequent movement of the squashed zone along the length of the tube (4); the movement of the squashed zone causing the expulsion of the product from the tube (4), in use, with consequent delivery thereof.

2. Apparatus according to Claim 1, characterised in that the tube (4) is oriented substantially vertically.

3. Apparatus according to Claim 1 or Claim 2, characterised in that the tube (4) is made from a plastics material which is compatible with contact with food substances.

4. Apparatus according to any one of the preceding claims, characterised in that the tube (4) carries an associated delivery nozzle (2) for the product at its lower end in use.

5. Apparatus according to any one of the preceding claims, characterised in that it includes an abutment

element (5) substantially coextensive with the tube (4) and against which the tube (4) is pressed by the presser unit (4).

6. Apparatus according to Claim 5, characterised in that the abutment element (5) carries associated thermal-conditioning means (6).

7. Apparatus according to Claim 5 or Claim 6, characterised in that the abutment element (5) is made from a material with a high thermal conductivity.

8. Apparatus according to Claim 7, characterised in that the abutment element (5) is of metal.

9. Apparatus according to any one of the preceding claims, characterised in that the presser assembly (8) includes at least one profiled body (13) with associated drive means (9, 10, 11) which can drive the profiled body (13) to effect a movement comprising:

- the approach of the profiled body (13) to the tube (4) with consequent squashing of the tube (4),
- the translational movement of the profiled body (13), maintained in a position in which it squashes the tube (4), along the length of the tube (4) itself, and
- on completion of this translational movement, the further movement of the profiled body (13) away from the tube (4) which is thus freed from squashing.

10. Apparatus according to Claim 9, characterised in that the presser unit (8) includes a plurality of profiled bodies (13) each of which can cooperate with the tube (4) to squash it and effect the subsequent translational movement of the squashed zone along the length of the tube (4).

11. Apparatus according to Claim 9 or Claim 10, characterised in that the at least one profiled body is constituted by a roller (13).

12. Apparatus according to any one of Claims 9 to 11, characterised in that the at least one profiled body is mounted on a motor-driven endless chain structure (9), the motor-driven (10, 11) chain (9) including an active pass (12) substantially coextensive with the tube (4).

13. Apparatus according to Claim 5 and Claim 12, characterised in that the abutment element (5) and the said pass (12) of the motor-driven (10, 11) chain (9) lie on opposite sides of the tube (4).

14. Apparatus according to Claim 9, characterised in that it includes an actuator element (29) having a shaft (28) which carries the at least one profiled body (13), the activation of the actuator (29) causing the movement of the profiled body (13) into the position in which it squashes the tube (4).

15. Apparatus according to Claim 14, characterised in that it includes a support structure (30) for the actuator element (29) with guide formations (31) for enabling the actuator element (29) to move in the general direction of extent of the tube (4), the movement of the actuator element (29) along the guide formations (31) causing the translational movement of the squashed zone of the tube (4).

16. Apparatus according to Claim 15, characterised in that the actuator element has associated drive means (32) for driving the movement of the actuator element (29) along the guide formations (31).

17. Apparatus according to Claim 16, characterised in that the drive means comprise an actuator (32).

18. Apparatus according to Claim 5 and any one of Claims 14 to 17, characterised in that the abutment element (5) and the actuator element (29) are located on the same side of the tube (4).

19. Apparatus according to any one of the preceding claims, characterised in that valve means (34) are associated with the lower end of the tube (4) in use, the valve means being operable (33) selectively to close the internal passage through the tube (4).

20. Apparatus according to Claim 19, characterised in that the valve means comprise a further profiled body (34) movable between a rest position, in which the further profiled body (34) does not interfere with the passage through the tube (4), which is thus completely open, and an active position in which the profiled body (34) acts on the tubular duct (4) to squash it and reduce its through-passage.

21. Apparatus according to Claim 20, characterised in that the further profiled body is constituted by a roller (34).

22. Apparatus according to Claim 5 and any one of Claims 20 or 21, characterised in that the further profiled body (34) acts by squashing the tube (4) against the abutment element (5).

23. Apparatus according to any one of Claims 20 to 22, characterised in that it includes a further actuator element (33) having a shaft (33a) on which the further profiled body (34) is mounted.

24. Apparatus according to Claim 22 and Claim 23, characterised in that the further actuator element (33) and the abutment element (5) are located on the same side of the tube (4).

25. Apparatus according to any one of the preceding claims, characterised in that it includes a plurality of said tubes (4) and in that the presser unit (6) includes at least one profiled body (13) which can act simultaneously to squash a plurality of the tubes (4).

26. Apparatus according to any one of the preceding claims, characterised in that it includes a plurality of said tubes (4) as well as a distributor element (15) for feeding the product to be delivered into the said plurality of tubes (4) in a uniform manner.

27. Apparatus according to Claim 26, characterised in that the distributor element (15) includes an inlet duct (22) and a plurality of distributor ducts (23) which branch from the inlet duct (22) in a generally conical arrangement towards their outlet ends which have associated connector ducts (14) for supplying the product to the said tubes (4).

28. Apparatus according to Claim 27, characterised in that the distributor ducts (23) and the connector ducts (14) define flow paths for the product which are of substantially the same length as each other.

29. Apparatus according to any one of Claims 26 to 28, characterised in that the distributor element (15) has associated thermal-conditioning means (16).

30. Apparatus according to Claim 29, characterised in that the distributor element (15) is made of thermally-conductive material.

31. Apparatus according to any one of Claims 26 to 30, characterised in that it includes a pressure regulator (18) located upstream of the distributor element (15) for supplying the substance to be delivered at a predetermined pressure.

FIG. 1

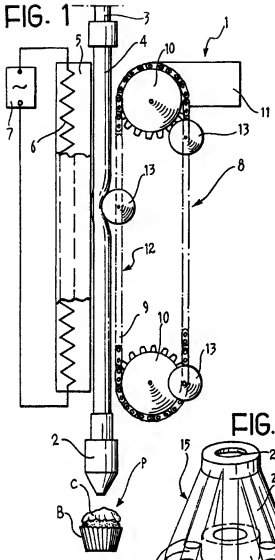


FIG. 2

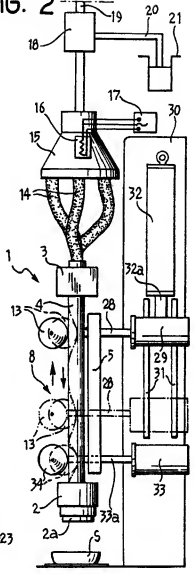
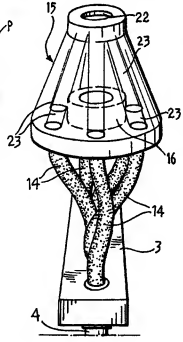


FIG. 3



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Application Number
EP 95 11 4220

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 201 389 (VIDAL LUCIEN RENE) 12 November 1986 * the whole document * ---	1,3-5, 9-13	G01F11/08 F04B43/12
X	EP-A-0 447 616 (VARTA BATTERIE) 25 September 1991 * the whole document * ---	1-5, 9-11, 14-17	
A	EP-A-0 105 771 (METAUX PRECIEUX COMP) 18 April 1984 * the whole document * ---	1-31	
A	FR-A-2 518 505 (TELLIER ETS L) 24 June 1983 * the whole document * -----	1-31	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	6 March 1996	Kouzelis, D

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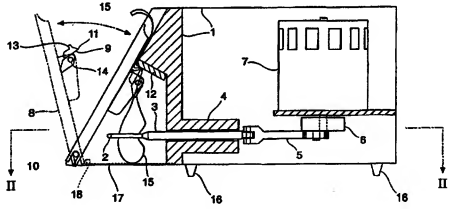
(54) Title: BAG BEATING MICROBE SUSPENDER WITH VIBRATING BEATER



(57) Abstract

A microbe suspender useful in the microbiological analysis of foods comprises a casing, means for releasably sealing a plastic bag containing test sample and suspending liquid inside the casing, and a beater which beats the outside of the plastic bag at a frequency high enough that the bag does not completely follow the beater movement so that microbe suspending shock waves are transmitted into the liquid at each impact of the beater with the bag, yet low enough in frequency that on each impact the beater remains in contact with the bag long enough to transfer stirring energy to the liquid and test sample to aid the removal of deep-seated microbes. As additional improvements over the art the suspender provides a collecting tray which prevents hazardous microbial suspensions reaching the bench in the event that a bag leaks, and an operator-protecting door that does not comprise part of the beating/suspending mechanism so that it can be transparent and permit the action to be viewed, and additionally the door is completely removable to improve the cleanability.

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BAG BEATING MICROBE SUSPENDER WITH VIBRATING BEATER

The invention relates to devices for suspending microbes or other analytes to allow the determination of the microbiological safety or hygienic quality of foods and other samples or to mix powders or liquids.

In order to determine the existence and quantity of microbes or other analytes in foods and clinical samples it is usual to remove them from the sample and disperse them in water or other liquid. The suspension preferably contains a minimum of debris suspended from the sample, since it may interfere with the analysis. An apparatus in which the sample is sealed in a plastic bag and kneaded by electric-motor driven paddles acting against a backing plate or operator-protecting door is described, for example in US Patent Number 3819158. This apparatus is more convenient than a blender because the disposable bag eliminates the need to clean and sterilize the apparatus. However, its crushing action still produces suspended debris and prevents it being used for samples containing hard objects because these pierce bags and cause them to leak. It also prevents the use safe of a transparent glass or plastic door so that it is not possible to see the state of the sample without switching off the apparatus and opening it up. Moreover, the means to releasably seal plastic bags between the operator-protecting door and the kneading paddles does not easily allow removal of the door to give the operator complete access to the kneading area. Thus it is difficult to clean up the mess when bag leakage occurs and in the event of a leak contaminated liquid drips onto the bench below the apparatus.

Sound vibrations in liquids cause liquid shear at the surfaces of immersed objects mainly because the differing densities of object and liquid prevent them from following the pressure waves at identical rates. Ultrasound, at frequencies higher than human hearing abilities removes microbes efficiently from foods in limited situations, producing microbial suspensions relatively free of debris. However, ultrasound is useful only where microbes exist on surfaces that are easily accessible to the sound energy because sound intensities high enough to agitate samples and release internal microbes rapidly kill them by cavitation. At lower sound frequencies the energy for a given amplitude is less

and cavitation is reduced; however, a device operating solely by sound energy in the audible range, such as might be generated by an electronic frequency generator and speaker or similar transducer would be impractically noisy in operation.

It should be noted that shock waves and sound waves are essentially similar and that shock waves can be generated in a liquid contained within a plastic bag by striking the bag sharply with a solid object. I have shown that a microbe suspender combining the microbe suspending ability of shock waves with a mechanical stirring effect that exposes the internal surfaces of samples without crushing them, suspends microbes very effectively. Such an action can be obtained by beating a liquid-containing plastic bag alternately on its opposite faces by a beater at a frequency which is high enough to prevent the bag completely following the movements of the beater so that in each cycle of the beater it hits the bag and sends shock waves into it, provided that said frequency also is low enough that during a relatively large proportion of the beater cycle the beater remains in contact with the bag and transfers its energy efficiently to the bag as stirring energy. This energetic beating action is also very effective for mixing dry powders or for suspending them in liquids.

My invention provides releasable sealing means for confining a test sample with suspending liquid in a plastic bag, and of transmitting suspending energy to said sample and suspending liquid by means of non-crushing impacts on the outside of the bag, said impacts being within a range of frequency and amplitude such that they produce a suspending energy composed of a combination of shock or sound waves and mechanical shaking. To achieve this the sample and suspending liquid is releasably sealed in a flexible bag so that the bag hangs freely with some air space above the liquid. The bag is then beaten by a vibrating or reciprocating beater which beats the bag on alternate sides at a frequency high enough that the bag is only able to partially to follow the movements of the beater thus producing an action in which:

(1) shock waves caused by impact of the beater with the bag have a suspending effect,

(2) impulses imparted to the liquid during the part of each cycle when the beater is in continuous contact with the bag produce a strong stirring action in the sample and suspending liquid which assists the suspending movement of liquid and by agitating the sample also improves the suspending effect, and

(3) no backing plate is required in order to produce the desired suspending action.

The beater is conveniently driven by an electric motor acting through a crank, but other sources of power are not excluded, for example, pneumatically reciprocating or electromagnetic actuators. Typically the beater is in the form of a horizontal oval and made of material not more than 6 mm diameter but other forms are not excluded, for example, a beater with vertical elements, flattened beating faces or a cup around the plastic bag. Because it does not need a backing plate my invention also provides an operator-protecting door of transparent material so that the operator to see the state of the operation, and this door is also completely removable to allow complete access to the microbe suspending area for easy cleaning. My invention additionally provides a tray to contain liquid in the event that bag leaks occur, to improve the cleanliness and safety of the laboratory.

The invention is described below in greater detail with reference to the accompanying drawings, which illustrate a preferred embodiment of the invention, and wherein:

Figure 1 is a schematic, longitudinal sectional view of a microbe suspender in accordance with my invention;

Figure 2 is a cross section taken generally along line II-II of Fig. 1; and

Figure 3 includes isometric views of a variety of beaters for use in the suspender of Figs. 1 and 2.

Referring to Figures 1 and 2, a rigid casing 1 carries all of the components of the invention. Beater means 2 of suitably stiff rod bent into a planar and horizontal oval is connected via shaft 3 through bushed plate 4 to connecting rod 5 and counter-balanced eccentric 6 to motor 7 so that when motor 7 is switched on the beater 2 reciprocates through an amplitude

determined by eccentric 6 and with frequency determined by motor 7. A removable door 8 carries on it a pivotable toggle bar 9 arranged so that when door 8 is in the open position as shown in broken lines the toggle bar 9 is maintained by a spring not shown in the drawing, so that the distance between the door fulcrum rod 10 and the toggle clamping edge 11 is reduced by a suitable amount such that on closing door 8, shown in solid lines, toggle clamping edge 11 is initially able to slide under rubber strip 12. However, as soon as the toggle trip edge 13 contacts rubber strip 12 it causes the toggle to rotate on its pivot 14 thereby increasing the distance between toggle clamping edge 11 and door fulcrum rod 10 and forcing toggle clamping edge 11 firmly into rubber strip 12. By resting plastic bag 15 containing liquid and sample against the outer edge of rubber strip 12 before door 8 is closed the bag becomes firmly clamped between toggle clamping edge 11 and rubber strip 12 until such time as the door is opened again.

The plastic bag 15 containing liquid and sample is placed so that it lies inside the oval of beater means 2. The gap between the parallel sides of beater 2 is such that on switching on motor 7 beater means 2 vibrates against the bag, and because the bag cannot completely follow the movement of beater 2 the impacts of beater 2 alternating on both walls of the bag create microbe-suspending shock waves and stir the suspension. For plastic bags 100-150 mm wide and containing 100 ml of liquid and sample satisfactory combinations of frequency and amplitude are 2,900 reciprocations per minute with an amplitude of 12-20 mm or 4,000-5,000 reciprocations per minute with an amplitude of 5-10 mm or values between thereof. At lower frequencies the bag and its contents follow the movement of the beater too closely and minimize the generation of shock waves; at frequencies much higher than 5,000 reciprocations per minute the bag does not follow the beater sufficiently and this minimizes the stirring effect. Suspending action is improved when there is a good air space above the sample being beaten and this is best obtained by sealing said bag between 50 and 125 mm above its bottom. If the seal is much higher than 125 mm the bag does not follow the movement of the beater sufficiently and if the seal is lower than 50 mm the shock waves easily

become too intense and the bag bursts. For a plastic bag 100-150 mm wide and containing 100 ml of liquid the beater will be wider than the bag and will surround the bag, the spacing between those elements of the beater which contact the bag being not less than 20 mm and not more than 40 mm. Rubber feet 16 reduce vibration of the bench when the apparatus is operating.

Any leakage of liquid from bag 15 during operation of the apparatus is prevented from dripping to the bench by tray 17 which is sealed to the lower edges of the suspending area. Lip 18 of tray 17 also serves as means to limit the angle of opening of door 8 during normal use. However, since door 8 is simply slotted where it fits on fulcrum rod 10 it may be completely lifted off if there is need to clean the apparatus.

Referring to Figure 3, acceptable forms of beater means are shown. The previously described oval of stiff rod 2 is shown in its perspective view 19. Other acceptable forms shown in perspective view are a beater with vertical beating elements 20, a beater with flattened beating faces 21, and a cup 22.

WHAT IS CLAIMED IS:

1. A microbe suspender comprising:

   a casing (1);

   an operator-protecting door (8) mounted on the casing;

   releasable sealing means (9)for a bag (15) containing sample and liquid disposed in the casing (1) such that the door (8) on closing releasably seals the bag (15);

   a vibrating beater (2) disposed in the casing (1) for beatingly engaging the bag (15) alternately on opposite faces, the vibrating beater (2) vibrating in a frequency range between 2,900 and 5,000 cycles per minute with an amplitude between 5 and 20 mm, and;

   drive means (7) for the vibrating beater (2).

2. A microbe suspender as in Claim 1, wherein the vibrating beater (2) engages the bag (15) with sufficient energy to generate shock waves in the liquid and agitate the sample and liquid contained in the bag (15).

3. A microbe suspender as in Claim 1 wherein the beater (2) is in the form of an oval ring surrounding the bag.

4. A microbe suspender as in Claim 1 wherein the drive (7) means for the beater (2) is an electric motor and crank (6).

5. A microbe suspender as in Claim 1 wherein the operator-protecting door (8) does not form part of the beating means.

6. A microbe suspender as in Claim 1 wherein the operator-protecting door (8) is completely removable from said casing (1).

7. A microbe suspender as in Claim 1 including a tray (17) in said casing (1) for catching any leaking from a bag.

8. A microbe suspender as in Claim 1 wherein the beater (21, 22) has flat beating faces.

9. A microbe suspender as in Claim 1 wherein the beater (20) has vertical beating elements.

10. A microbe suspender as in Claim 1 wherein the beater is in the form of a cup (22).

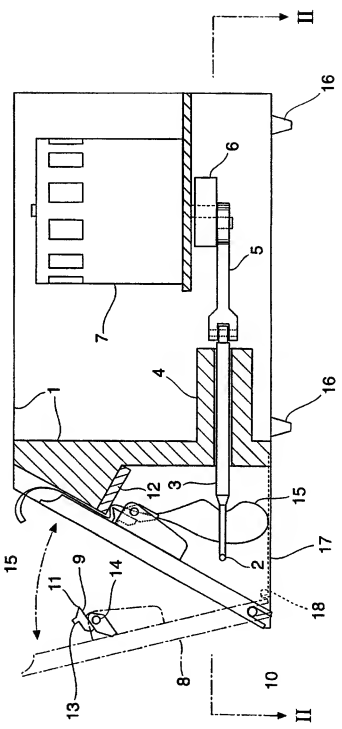

FIG. 1

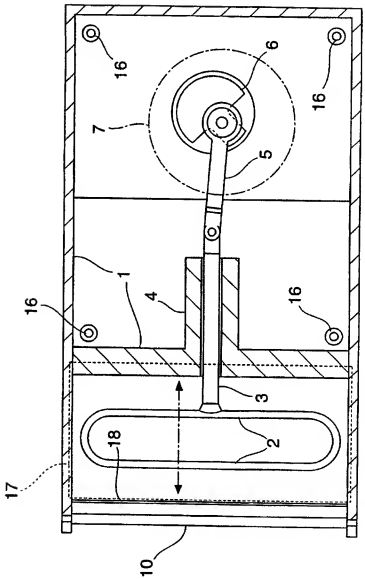

FIG. 2

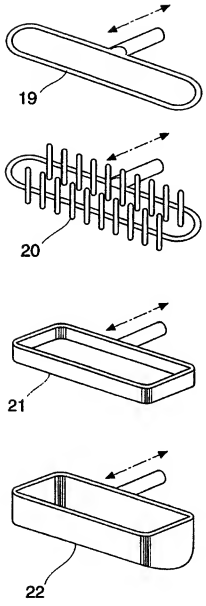

FIG. 3

INTERNATIONAL SEARCH REPORT

Interna' 1 Application No
PCT/CA 97/00320

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B01F11/00 C12M1/33 C12M3/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 819 158 A (SHARPE A ET AL) 25 June 1974 cited in the application ---	
A	PATENT ABSTRACTS OF JAPAN vol. 011, no. 262 (C-442), 25 August 1987 & JP 62 065724 A (CHIYODA TECH & IND CO LTD), 25 March 1987, see abstract ---	
A	WO 95 02457 A (SHIMAKYU CHEMICAL CO LTD ;YAMAUCHI HIROSHIGE (JP); NISHI SHOMOSUKE) 26 January 1995 ---	
A	WO 95 02458 A (SHIMAKYU CHEMICAL CO LTD ;TAKEMOTO MASAHIRO (JP); YAMAUCHI HIROSHI) 26 January 1995 -----	

☐ Further documents are listed in the continuation of box C.

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3

Date of the actual completion of the international search	Date of mailing of the international search report
4 August 1997	08.08.97
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Information on patent family members

Internat ' Application No
PCT/CA 97/00320

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		JP 7113596 B	06-12-95
		EP 0707892 A	24-04-96
		US 5586732 A	24-12-96
WO 9502458 A	26-01-95	JP 7027685 A	31-01-95
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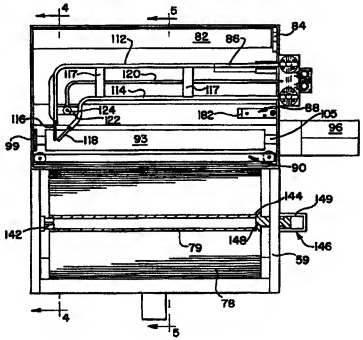
(54) Title: APPARATUS AND METHOD FOR PRODUCING FOAM CUSHIONS UTILIZING FLEXIBLE FOAM MIXING CHAMBER

(57) Abstract

A protective foam cushion-making apparatus (50) dispenses reactive foam components (110, 111) into an interior space between two panels (70, 71) of plastic film to form protective foam cushions (62). The apparatus includes a supply of plastic film (78) and a film driving assembly (85), such as two pliable rollers (92, 93). A foam component dispensing assembly (86) is interposed between the film panels and injects reactive foam components (110, 111) into the interior space where they are mixed together to form a mass of expandable foam (64). The plastic film forms a flexible mixing chamber (134) in the area between the two pliable rollers in which the reactive foam components are mixed together after they are dispensed from the foam dispensing assembly.



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APPARATUS AND METHOD FOR PRODUCING FOAM CUSHIONS UTILIZING FLEXIBLE FOAM MIXING CHAMBER

Background of the Invention

The present invention relates generally to apparatus and methods for forming individual foam-filled bags commonly used as protective cushions in the packaging arts. More particularly, the present invention relates to apparatus and methods for forming such protective cushions by dispensing two streams of reactive foam components between opposing panels of a flexible sheet material and mixing the streams together therebetween in order to produce an expandable foam between the panels.

In the packaging industry, expandable foams have been used for some time to form protection for packaged articles. Conventional practice in such industry has included filling a cardboard box with an expandable foam, such as a urethane or polyurethane foam, and contacting the foam with a plastic barrier sheet to create a protective cushion and then placing an article for shipping into the box on the cushion. The article may then also be covered with another plastic sheet and a second filling of expandable foam accomplished before closing the box.

Another practice in the industry utilizes foam cushions which are inserted into the packing box immediately after the foam cushions are made. This is accomplished by

machines which react two foam components together in a gun apparatus and then dispense the foam so formed between two opposing plastic sheets, and seal the edges to form a protective foam cushion. Numerous patents exist which describe such methods and apparatus. Two such patents, U.S. Patent No. 4,999,975, issued March 19, 1991 and U.S. Patent No. 4,800,708, issued January 31, 1989 describe apparatus for foam cushion making in which a foam dispenser, or gun, is positioned between two opposing plastic panels. Two different reactive foam components, commonly referred to as foams precursors, are mixed together in the foam gun in order to form the foam, which is then dispensed under pressure between the two opposing plastic panels to form the foam protective cushions.

Although such apparatus and methods are operational and produce protective foam cushions which adequately provide protection to packaged articles, they are not without certain inherent disadvantages. For example, they reply upon a mixing chamber or cartridge in the foam gun to provide an area wherein the foam components are mixed together to form the expandable cushioning foam. Once formed, the foam is then dispensed under pressure through a nozzle downstream of the mixing chamber. The mixing chamber typically accumulates hardened foam over time and thus must be cleaned at regular intervals, typically at weekly intervals. The apparatus must then be taken apart to be cleaned, thereby leading to detrimental downtime of the apparatus.

Other apparatus rely upon a complex foam dispensing

gun structure which utilizes two ports to convey the two reactive foam components to a mixing chamber preceding the dispensing end of the gun. In this type apparatus, the mixing chamber may include a valving rod which slides in and out of the mixing chamber to control the flow of at least one of the reactive foam components. This type of apparatus is also not without certain disadvantages, for although the valving rod effectively acts as a valve to control the flow of the reactive foam components into the mixing chamber, the foam formed by the reactive components has been known to slowly build up in the mixing chamber and on the valving rod itself. Additionally, when a valving rod is used, "crossover" between the foam components may occur when one of the foam components accumulates on the valving rod and makes contact with into the other foam component as the valving rod slides back and forth to form a reacted, hardened foam. The valving rod then must be cleaned, which typically requires scraping the accumulated foam off of the valving rod. Each cleaning wears down the tolerance of the rod to eventually wear down the overall effectiveness of the foam dispensing gun of these devices.

In order to prevent the buildup of foam in the mixing chamber and dispensing nozzles of the aforementioned apparatus, solvent systems which continuously dispense solvents through the foam dispensing systems used therein in order to maintain them in a clean state. These solvent systems increase the complexity and cost of the apparatus.

The present invention is directed to an apparatus and methods for producing foam cushions which overcomes these

disadvantages.

Summary of the Invention

In an apparatus and in methods according to the present invention, foam cushion-making apparatus and methods are characterized by an entirely different and new foam dispensing assembly which represents a significant departure from the prior art in that the present invention does not utilize any foam dispensing gun or assembly which has a mixing chamber in which reactive foam components are first mixed and then dispensed into a bag which encloses the mass of expandable foam.

Rather, the present invention represents a quantum leap in the foam cushion-making arts by creating a flexible mixing chamber formed by the opposing panels of the plastic film itself which encloses the foam cushions made with the apparatus. This flexible mixing chamber removes the mixing area completely from the foam dispensing assembly where it must be periodically removed and cleaned and places the mixing area within the bag, thus avoiding time-consuming cleanings and maintenance shutdowns. This relocation also eliminates the need for a solvent system associated with the foam dispensing assembly to maintain it in a clean state.

The novel relocation of the mixing area by the present invention outside of the foam dispensing gun and entirely within the opposing panels of the bag which encloses the foam cushion leads to virtually flawless foam dispensing by the apparatus and increased reliability and efficiency of

operation.

In one principal aspect of the present invention, a foam cushion-making apparatus includes a film supply in the form of a continuous plastic web folded upon itself to define a partial flexible envelope having two opposing film panels interconnected at one marginal edge by the fold of the film. The envelope is advanced through the apparatus by a film driving means across a foam dispensing assembly so that the opposing film panels of the envelope are drawn across opposite sides of the foam dispensing assembly. The foam dispensing assembly extends into the film driving means and separately dispenses two reactive foam components into the space between the film panels to form an expandable foam mass therebetween.

In another principal aspect of the present invention and as exemplified in one embodiment, the film driving means includes a driving roller and a driven roller which contact each other at a nip or interference chord. The opposing film panels of the flexible envelope pass across the foam dispensing assembly and through this nip where they are contacted in driving engagement by the rollers of the film driving means. The nip of the rollers provides support for a flexible mixing chamber adjacent the rollers and also resists the backpressure developed by the reacting foam components. The nip and the rollers cooperate to maintain the foam components within the flexible mixing chamber and the rollers assist in the mixing of the foam components together in the flexible mixing chamber. In a unique and remarkable departure from the prior art, the film opposing panels act as walls of

the flexible mixing chamber as they pass through the film driving means and subsequently act as the outer bag of the protective foam cushion as they pass downstream of the film driving means.

In still another principal aspect of the present invention and as exemplified by one embodiment of the invention, the film driving means rollers includes a pair of counter-rotating brushes having a plurality of brush elements, such as hairs or fibers disposed thereon which extend along the length of the rollers in the areas thereof which contact the film panels. The brushes contact the opposing film panels of the envelope as they pass therebetween and provide support to the opposing film panels of the flexible mixing chamber, while they assist in mixing the reactive foam components together. Additionally, the brushes may be formed from anti-static material to reduce film static and provides tautness across the length of the film.

In still another principle aspect of the present invention, a rigid support may be provided for the flexible mixing chamber which utilizes one or more rigid members having an opening through which the opposing film panels pass. The foam dispensing assembly extends into this opening between the opposing panels and the foam reactive components are injected into the interior space between the opposing film panels.

In yet another principal aspect of the present invention, the film driving means utilizes a differential driving arrangement to achieve the film through the apparatus wherein the film driving means operates at a faster rate than

the film in order to straighten out any wrinkles which may develop in the film as it passes through the apparatus.

The panels of the plastic film are folded upon each other in face-to-face contact in the preferred embodiment and thus the possibility exists that the opposing film panels may shift out of alignment along one of their mating edges or one of the panels may remain flat, while the other becomes wrinkled or crumpled. In order to avoid this problem, the present invention incorporates a novel film tensioning means to apply tension to the film web during operation. This film tensioning means operatively interconnects the film supply roll with an idler roller over which the film passes as it pays out from the film supply roll on its way to the film driving means so that there is always a predetermined amount of tension applied to the film web regardless of the diameter of the film supply roll.

In this film tensioning means, both the film supply roll and the idler roller each have one of their ends fixed for rotation to the frame of the apparatus. The opposite ends of these two rollers include pneumatically actuatable elements which apply resistance to the film supply roll. This resistance controls the rate at which the film pays out from the supply roll and moves the idler roller as needed near to or away from the film driving means to increase or decrease the film tension.

In a still further aspect of the present invention, the idler roller and film supply roll are operatively interconnected by pneumatic means so that as the idler roller

moves near to or away from the film driving means, air pressure is selectively supplied to or bled off from a film supply roll braking element.

In still another principal aspect of the present invention, an assembly is provided for producing a transverse seal on the front and rear ends of the foam cushion bags as they pass through the apparatus. This seal assembly includes a roller member extending across the travel path of the film, a resistance wire which extends across the travel path of the film and a seal bar which is aligned with the roller member and resistance wire. The film web is interposed between the roller member, resistance wire and the seal bar so that the seal bar may be selectively actuated to bring the resistance wire into contact with the film and against the roller member to seal the top of a bag exiting apparatus, cut that bag loose from the film web and seal the bottom of a successive bag exiting the apparatus.

In yet another principal aspect of the present invention, means are provided for forming a seal along one or more of the lengths of the web of film at the marginal edges thereof. This sealing means includes two members which clamp an edge of the film. Hot air is fed to one of the clamping members and against the film held therebetween to effect a seal between the opposing film panels at the edge. The other of the two clamping members is provided with a plurality of heat dissipating members, typically in the form of fins, so that this other clamping member consistently remains cool, at a temperature lower than the melting temperature of the film,

in order to prevent ribbon cutting of the film at the marginal edges. The flow of heated air to this sealing means may be periodically interrupted to create a vent so that gases formed in the foam reaction may escape from within the cushion bag.

These and other objects, features, and advantages of the present invention will be clearly understood through a consideration of the following detailed description wherein like reference numerals refer to like parts.

Brief Description of the Drawings

In the course of this detailed description, reference will be made frequently to in which:

FIG. 1 is a perspective view of one embodiment of a foam-cushion-making apparatus constructed in accordance of the principles of the present invention;

FIG. 2 is a frontal sectional view of the apparatus of FIG. 1 taken along lines 2-2 thereof.

FIG. 3 is a perspective view of the apparatus of FIG. 1 with the cover removed illustrates a protective foam cushion being made and the path of travel of the plastic film;

FIG. 4 is a sectional view of the apparatus of FIG. 2 taken along lines 4-4 thereof;

FIG. 5 is a sectional view of the apparatus of FIG. 2 taken along lines 5-5 thereof;

FIG. 6 is an elevational view of the foam dispensing assembly used in the apparatus of FIG. 1 with the front film driving roller removed for clarity;

FIG. 7 is an end view of the foam dispensing

assembly of FIG.6 taken along lines 7-7 thereof;

FIG. 8 is a sectional view of a nozzle used in the foam dispensing assembly of the apparatus of FIG. 1;

FIG. 9 is a sectional view taken through the film driving means illustrating the orientation of the foam dispensing assembly, the brush rollers and the film web and further depicting the flexible mixing chamber of the apparatus;

FIG. 10 is a plan view of a protective foam cushion made by the apparatus of FIG. 2;

FIG. 11 is a partial schematic view of the film tensioning means utilized in the apparatus of FIG. 1 which operatively interconnects the film supply roll, shown in cross-section, with the film guide roller;

FIG. 12 is a sectional plan view of the edge seal assembly used in the apparatus of FIG. 1;

FIG. 13 is a sectional view of the apparatus of FIG. 4, taken along lines 13-13 thereof, illustrating the film crosscut seal assembly of the present invention;

FIG. 14 is a schematic view of the crosscut assembly of FIG. 13 illustrating the assembly in a static condition as the film web passes through the apparatus;

FIG. 15 is the same view as FIG. 14 illustrating the assembly in an operative condition making a cut in the film web;

FIG. 16 is a perspective end view of a brush roller used in the apparatus of FIG. 1;

FIG. 17 is a perspective view of an alternate film

driving roller used in an alternate embodiment of the present invention;

FIG. 18 is a sectional schematic view of a third embodiment of the present invention; and,

FIG. 19 is a schematic view of the nozzle end of the foam dispensing assembly of the apparatus of FIG. 2.

Detailed Description of the Preferred Embodiments

Referring now to the drawings, and in particular, FIGS 1-7, a preferred embodiment of a foam cushion-making apparatus 50 incorporating the principles of the present invention is shown mounted on an upstanding support 52 which includes a vertical stanchion 54 rising upwardly from a multi-leg base 56. The stanchion 52 supports an apparatus frame 58, which in turn supports the various functional components of the apparatus 50 within an exterior protective housing 60. The apparatus 50 is useful in producing protective foam cushions 62 in which a mass of expandable foam 64, such as a urethane or polyurethane foam, is enclosed within an outer plastic film 66 which takes the form of an envelope or bag 68.

As shown in greater detail in FIG. 10, the outer bag 68 which envelopes the foam cushion 62 may take a rectangular or square configuration. The plastic film 66 used for the bag 68 is folded upon itself at a general centerline 69 thereof to define a partial envelope in which two opposing panels 70, 71 of the plastic film 66 confront each other. When produced by apparatus 50 of the present invention, the foldline 69 of the bag 68 occurs along the length L of the bag 68 at one marginal

edge 72 thereof, The other lengthwise marginal edge 73 is provided with an edge seal 74, while the leading and trailing edges 76, 77 (which extend transversely along the width W of the bag) are sealed when the bag is cut from the plastic film 66 which is supplied to the apparatus 50 from a film supply roll 78 rotatably mounted on the lower portion 59 of the frame 58 underneath the housing 60 and containing a continuous web 80 of film 66.

The film 66 is supplied to the apparatus 50 as a continuous web 80 and passes over a film guide roller 82 rotatably mounted within the frame 58 and into engagement with a film driving means 85 which drivingly engages the film 66 and advances it through the apparatus 50. A foam dispensing assembly 86, is mounted within the housing 60 adjacent the film driving means 85 so that it is interposed between the opposing film panels 70, 71. The apparatus 50 further includes means for sealing together the open edges 73, 76 & 77 of the plastic film 66 which includes an edge seal assembly 88 and a crosscut seal assembly 90, which respectively seal the open marginal edges 73 and transverse edges 76, 77 of the film 66 as it advances through the apparatus 50.

Film Driving Means

Turning now to FIGS. 3-5, the details of the film driving means 85 are shown and will now be described. It can be seen that the film driving means 85 includes a pair of elongated, circular film driving members 92, 93 which extend between the sidewalls 61 of the apparatus housing 60. The

film driving members 92,93 include a driving member 90 and a driven member 92 that are driven by an electric motor 96. Gears 98, 99 are mounted on respective shafts 104, 105 of the film driving members 92, 93 and are intermeshed together so that when drive is applied to the driving member by way of the motor 96, the gears effect a like rotation in both the driving and driven members 92, 93.

As will be explained in greater detail below, it is preferable that the film driving members 92, 93 take the form of pliable rollers, and most preferably brush rollers 100. As shown in FIG. 16, the brush rollers 100 may include a base sleeve 102 that receives respective shafts 104, 105 and which may be held in place by a positioning collar 129. The rollers have a plurality of brush elements 106, in the form of fibers, hairs, bristles and the like which extend radially outwardly therefrom. Synthetic or natural materials may be used for the brush elements 106. These brush elements 106 are an important departure from prior art foam cushion-making apparatus in that they serve not only to assist in the mixing of the cushioning foam components, but also assist in ensuring alignment and coplanarity of the opposing film panels 70, 71 of the film web 80 as it passes through the film driving means 85. The brush rollers 100 may utilize anti-static material as the composition for its brush elements to decrease the occurrence of any static cling occurring with the film panels 70, 71.

Foam Dispensing Means

In one important aspect of the present invention,

the foam dispensing assembly 86 takes the form of a foam dispensing gun 108 that extends for substantially the entire length of the film driving means 85 and is disposed adjacent thereof. The foam dispensing gun 108 serves to supply two streams 110, 111 of foam reactive components, also known as foam precursors, to the interior space 75 of the film web 80 between the two opposing film panels 70, 71 thereof. In a significant departure from prior art foam cushion-making apparatus, there is no mixing chamber disposed in line within the foam dispensing gun 108. Rather, the foam dispensing gun 108 includes two separate foam component supply tubes 112, 114 which are spaced apart from each other and held in place by one or more spacers 116.

The foam component supply tubes 112, 114 extend for the length of the film driving means 85 to a point near the folded centerline 69 of the film 66 and then extend downward toward the film driving means 85. The supply tubes each terminate in foam dispensing nozzles 116 & 118. The nozzles 116, 118 are preferably replaceable and may include as illustrated in FIG. 8, a hollow passage terminating in an orifice 123. The other ends of the nozzles may be threaded, as at 127, to provide an aspect of interchangeability and quick replaceablility.

As shown best in FIGS. 6 & 19, one of the foam component supply tubes 112 extends vertically while the other foam component supply 114 extends at an angle thereto so that imaginary lines drawn along the longitudinal axes L_1, L_2 of the nozzles 116, 118 intersect together so that the two streams of

foam components 110, 111 contact each other after they exit the dispensing nozzles 116, 118. The foam dispensing gun 108 includes a gun block 109 which contains two valves 126, 128 which control the flow of foam components which enter the gun 108 under pressure from a pressurized supply of same (not shown). The gun block 109 may also include in-line heaters 115 to heat the reactive foam component streams 110, 111 to prevent any cold shot from occurring which affects the chemistry which might result in less than optimally mixed and reacted foam components.

The foam dispensing gun 108 further includes a vacuum tube 120 which leads to a vacuum sensing block 122. The vacuum tube 120 is connected to a source of negative air pressure (not shown) and draws a slight constant vacuum on the two opposing film panels 70, 71 by way of two vacuum ports 124, 125. This vacuum draws the film panels 70, 71 passing over the foam dispensing gun 108 into contact with the vacuum ports 124, 125 and thereby provides a means for detecting the presence of the film web 80 in proximity to the loan dispensing gun nozzles 116, 118. When the negative air pressure is maintained such as when the plastic film web 80 is passing over the gun 108 and its vacuum ports 124, 125, a signal is sent to a programmable logic controller (PLC) which in turn sends a signal to the foam dispensing gun 108 to actuate the foam dispensing valves 126, 128 of the gun to maintain it in a "firing" state where it dispenses the two streams of the reactive foam components 110, 111 into the interior space 75 between the opposing film panels 70, 71.

When either of the vacuum ports 124, 125 draws a positive pressure such as will occur when the plastic supply roll 78 is exhausted or if a tear should occur in the bag film 66, a signal is sent to the PLC which closes the gun valves 126, 128. This condition also occurs when the gun 108 is tilted out of its operational position above the apparatus 50. This system thus prevents injection of foam components into the nip 130 of the rollers 92, 93 unless a whole film 66 is present to provide a mixing chamber 132.

The foam dispensing assembly 86 also includes a film engagement member, in the form of a spacer 119 which is positioned on the outboard edge of the one foam component supply tube 112. This spacer 119 preferably includes an exterior radius 121 which engages the foldline or centerline 69 of the plastic film 66. This spacer 119 assists in aligning the free film edges 73 together and spaces the gun nozzles 116, 118 and point of foam injection from the edge 69 of the film 166.

Foam Mixing Chamber

As mentioned above, the present invention does not rely upon an in-line mixing chamber in place within the foam dispensing gun 108, but rather, the nozzles 116, 118 of the gun 108 extend into the film driving means 85, more specifically, into the nip 130 which occurs between the driving members 92, 93. As shown in FIGS. 6 & 9, wherein the film driving members 92, 93 are depicted as brush rollers 100, the nozzles 116, 118 are positioned approximately at the

centerline C of the rollers 92, 93. When the nozzles 116, 118 are positioned between the rollers 92, 93, it has been found that the foam reactive components effectively mix together and react to form an expandable foam (FIG. 9). The mixing of these two foam components occurs in what I characterize as a "flexible" mixing chamber 132, which is defined in part by the opposing film panels 70, 71 and particularly the interior surfaces thereof. The rollers 92, 93 assist in the mixing in that they exert pressure on the film panels 70, 71, that define the walls of the mixing chamber 132. The rollers 92, 93 therefore not only facilitate the mixing of the foam components, but also provide support for the film panels 70, 71 during expansion of the foam mass 64 during the initial reaction phase of the foam components 110, 111.

It is believed that the mixing occurs primarily at the centerline C of the nip, or interference chord 130 where the two rollers 92, 93 meet and press against each other, and below it. The pressure which the two rollers 92, 93 exert on the film panels 70, 71 is greatest at the nip 130, and in particular at the centerline C thereof. This pressure advantageously creates a low pressure seal on the film web 80 as it passes through the rollers 92, 93 which also facilitates mixing because it prevents backpressure of the foam developed during reaction and expansion from driving the expanding foam above the rollers. As a result of this pressure seal, the foam may be delivered at higher delivery pressures than were heretofore possible, in the area of about 20 lbs per minute.

It will then be understood that the combination of

the pliable rollers 92, 93 and the opposing film panels 70, 71 uniquely defines a flexible mixing chamber 132 wherein the film panels 70, 71 define the walls of the mixing chamber at the level of the film driving means 85 and define the exterior walls of the protective foam cushion 62 at a level downstream of the film driving means. The pliable rollers 92, 93 support the walls of the mixing chamber, i.e., the opposing film panels 70, 71 as well as assist in the mixing of the foam component streams 110, 111 together. Advantageously, when brush rollers 100 are used as the pliable rollers 92, 93, the brush elements 106 have been found to provide an additional advantage in that they impart a straightening effect on the film panels 70, 71 as well as provide a positive engagement with the film web 80. As shown in FIG. 17, the pliable rollers 92, 93 may also utilize a soft, deformable outer covering 134, formed from a suitable material such as an open cell polyurethane or foamed neoprene where the natural exterior curvatures of the two rollers 92, 93, meet and compress against each other at the nip or interference chord 130 of the rollers. Should such a pliable covering be used for the rollers 92, 93, it may be necessary to provide drive surfaces, such as pinch rollers, at the ends of the rollers to ensure advancement of the film.

It will be further understood that although two types of supports for the flexible mixing chamber 134 are described herein in detail, inasmuch as the flexible mixing chamber 134 is defined mostly by the opposing film panels 70, 71, means other than the rollers of the film driving means may

be used to support the film 66. Such an alternate embodiment is schematically depicted in FIG. 18 and explained in greater detail below and wherein the film 66' passes between two rigid supports in the form of blocks 200, 201 defining a passage into which foam component streams 110, 111 are injected from the foam dispensing gun 108'.

Film Tensioning Means

The present invention also provides a film tensioning means in order to consistently maintain a desired amount of tension on the film web during advancement. This tensioning means operatively interconnects together the film supply roll 78 which holds the film web 80 and the film guide roller 82. This operative interconnection is effected primarily by way of a pnuematic coupling 140 which includes air tubes 141 that link the film supply roll 78 together with the film guide roller 82 at the top of the apparatus frame 58. As shown in FIGS. 2 & 11, the film supply roll 78 is held in place on the lower portion 59 of the apparatus frame 58. The supply roll 78 is fixed for rotation in the frame 58 at one end 142 of the supply roll 78 and engages at its opposite end 144, what may be aptly characterized as an air braking assembly 146 which selectively applies a braking, or axial resistance force F_T, to the film supply roll 78. This air brake assembly 146 includes a shaft 147 having a tapered, central hub portion 148 and a flat piston face 150 opposite thereof. The shaft 147 is held within and is displaceable within a cylindrical housing 149 in response to fluid

pressure, such as air pressure, exerted thereagainst. Such fluid pressure causes the assembly 146 to displace longitudinally within the housing 149. When air pressure is supplied to the housing 149 through an air orifice 152, the tapered hub 148 is pressed against the face of the core 79 of the film supply roll 78 to thereby apply a resistance force to the film supply roll 78.

The pneumatic coupling 140 also supplies positive air pressure to the engagement end 83 of the upper film guide roller shaft 84 to maintain an appropriate tension on the edge 73 of the plastic film 66 in the area of the edge seal 74 thereof. This shaft end 83 is held in a tension valve block 151 and has a load applied to it by a load spring 152 which exerts a spring force F_S against an engagement end 83 of the film guide roller 83. This load spring 152 holds a seal member 154 against an air orifice 156 aligned therewith in the tension valve block 151. Air pressure through the pneumatic coupling 140 applies an air pressure force F_A which maintains a static condition on the film guide roller shaft engagement end 83 which approximates the spring force that the load spring 152 applies to the shaft end 83. In this state, it maintains an axial pressure on the film supply roll 78 due to air pressure impacting against the piston face 150 of the air brake assembly 146 which increases the resistance to the film supply roll paying out the continuous web 80.

When the film tension in the web 80 reaches too high a level as it unwinds from the film supply roll 78, the tension applies a downward force, F_f on the upper film guide

roller 82. This downward force causes the film guide roller 82 to move slightly downwardly at its movable end 83 against the load spring 152. As the load spring 152 compresses, the seal member 154 disposed on the shaft engagement end 83 breaks its sealing engagement with the air orifice 156 and thereby bleeds off air pressure from the coupling 140 at a rate greater than the air supplied to the tensioning system, thereby lowering the air pressure in the film supply roll air braking assembly 146. The air then escapes from the housing 149 thereof and releases the axial force which the tapered hub 148 applies against the supply roll 78 and so reduces the tension on the film 66. This tensioning means is advantageously aligned with the open edges of the film panels 70, 71 where the edge seal of the foam cushion bags 62 are formed.

Film Crosscut Seal Means

Turning now to FIGS. 13-15, the details of the crosscut seal assembly 90 used with the apparatus 50 are shown. This assembly 90 cuts the film envelope in a crosswise, or transverse manner preselected between successive foam cushion bags 68 intervals corresponding to any predesired length of foam cushion bag. As illustrated in FIGS. 4 & 5, the crosscut seal assembly 90 is disposed within the apparatus housing 60 at a level beneath the film driving means 85. The assembly 90 includes an electrical heating wire 160 which extends lengthwise between the sidewalls of the housing 60 and frame 58. The wire 160 is held under tension by two springs

162 which engage it via retainers 164 applied to opposite ends of the wire 160. The wire 160 is positioned in alignment with a roller 166 having a Teflon outer sleeve 167 disposed thereon and the wire 160 is further spaced apart from the surface of the sleeve 167 a predetermined distance "D". A crosscut bar 168 is mounted in alignment with the wire 160 and the roller 167 and preferably at the same level therewith. This bar 168 is mounted on two air cylinders 169 and has a preformed bow in it such that the ends 170 of the bar 168 curve slightly rearwardly from the center 171 of the bar 168. The displacement of this bow is shown at "B" and it permits an equal force to be applied to the plastic film 66 as it passes through the assembly 90 so that a reliable crosscut seal is effected and an equal force is applied to "sandwich" the plastic film 66 between the bar 168 and the heating wire 160 and roller 166 as shown in FIG. 15. Preferable results have been obtained using a bow of approximately 0.375 inch. The seal so formed defines the trailing edge 77 of the foam cushion completed by the apparatus 50 while also forming the leading edge 76 of the next foam cushion 62.

Film Edge Sealing Means

FIG. 12 illustrates, in section, the details of a film edge seal assembly 88 which is used to form an edge seal 74 along the marginal edges 73 of the film 66 opposite the film centerline 69. This assembly 88 includes a heater tube 175 which houses an electrical heater element 176. Hot air is blown into the hollow core 178 of the heater tube 175 and is

directed against the film 66 by way of a small gauge needle 180. The hot air is directed onto the film 66 and onto a rear seal bar 182, preferably formed from a thermally conductive material, such as aluminum. A corresponding counterpart front seal bar 184 is disposed in alignment with the rear seal bar 182 at the free edge 73 of the film 66. Importantly, the front seal bar 184 is also formed from a thermally conductive material, such as aluminum, and has a plurality of heat dissipating fins 186 formed thereon to form a heat sink for the edge seal assembly 88.

Hot air is supplied through the heater tube 175 and the flow of this heated air is controlled by a solenoid operated valve 187. The air is delivered at a constant temperature of about 700°F. However, the heat dissipating fins 186 of the front seal bar 184 maintain it in a "cool" state, that is, below the melting temperature of the film. This effectively prevents the plastic film 66 from sticking to the edge seal assembly components and also prevents the hot air from cutting a ribbon of film from the edge 73 of the film.

The two edge seal bars 182, 184 further cooperate to apply a flat pressure on the film edge 73 which reinforces the newly made edge seal 74. The film edge seal assembly 88 is also used to form a vent 190 in the foam cushion bags 68 in order to permit the escape of gases formed during the foam reaction process. This may be done by intermittently turning the solenoid valve 187 which controls the airflow off. When the airflow is turned off, no edge seal 74 will be formed at

the edge 73. This permits the vent 190 to be formed at any location along the edge 73 of the bag 68. Preferable results have been obtained by placing the vent in the center of the edge 73 as shown in FIG. 1.

The apparatus of the present invention may also take the form of an alternate embodiment 50' shown in FIG. 18, where the plastic film 66' is fed to the apparatus 50' as two separate webs, or film panels 70', 71' which are sealed together at their opposing edges by an appropriate means. The panels 70', 71' may be fed by conventional drive rollers 92', 93' over a foam dispensing assembly 86' and into a passage or opening 200' formed in part by two rigid support members in the form of support blocks 202', 203' which provide support for the film panels 70', 71'. The foam components (only one such stream 110' and nozzle 116' being shown for purposes of clarity) are injected under pressure into the interior space 75' between the two film panels 70', 71' which define a mixing chamber 134' that is supported by the support members 202', 203'. Mixing and reacting of the foam takes place in the chamber 134' to produce foam cushions. A suitable crosscut seal assembly 90' may be provided to effect the necessary crosscut seals on the cushion bags. In order to resist the foam backpressure caused during reacting, the support members 202', 203' may have opposing lips 205'.

Therefore, it will be understood that the present invention advantageously provides a foam in place apparatus which does not require a separate in-line mixing area which needs to be taken apart to be cleaned. The nozzle placement

and design of the present invention removes the foam dispensing parts from the gun assembly and positions them into the bag which envelops the foam cushion. This structural arrangement increases the reliability of the apparatus and leads to virtually flawless foam dispensing.

While the preferred embodiments of the invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made therein without departing from the spirit of the invention, the scope of which is defined by the appended claims.

I claim:

1. An apparatus for successively forming foam cushions especially useful in packaging of products, wherein each foam cushion include two opposing flexible panels connected together along perimeters of said flexible panels to form a bag, the opposing flexible panels defining an interior space therebetween which is filled with a cushioning foam, the apparatus comprising, in combination:

a supply of flexible film, the film supply including a continuous web of film defining two opposing film panels disposed in face-to-face contact, the continuous web of film having a first edge extending lengthwise along one side thereof;

a foam dispensing assembly interposed in a travel path of said film web;

means for driving said film web along said travel path through said apparatus; and,

a flexible mixing chamber in which foam components dispensed from said foam dispensing assembly are mixed together to form an expandable foam, the flexible mixing chamber being disposed in said film web travel path proximate to said foam dispensing assembly, said flexible mixing chamber being formed in part by said opposing film panels, said opposing film panels defining walls of said flexible foam mixing chamber within said apparatus when said opposing film panels are disposed within said apparatus and defining walls of said foam cushion bag

when said opposing film panels are exterior of said apparatus.

2. The apparatus of claim 1, wherein said film web driving means at least partially supports said flexible mixing chamber and said film web driving means includes a driving roller and a driven roller disposed on opposite sides of said opposing film panels.

3. The apparatus of claim 2, wherein said driving and driven rollers are flexible and contact each other along a nip.

4. The apparatus of claim 3, wherein at least one of said driving and driven rollers is a brush roller having a plurality of brush fibers extending radially outwardly therefrom along a predetermined length of said one roller.

5. The apparatus of claim 1, wherein said foam dispensing assembly includes two nozzles extending between said film web opposing panels, said foam dispensing assembly further including first and second means for selectively supplying first and second foam components respectively to said two nozzles.

6. The apparatus of claim 5, wherein said nozzles each have foam dispensing openings which are positioned between

said driving and driven rollers at a centerline of said driving and driven rollers.

7. The apparatus of claim 1, further including means for sealing together open edges of said opposing film panels which are disposed opposite said film web first edge.

8. The apparatus of claim 1, further including means for applying a predetermined amount of tension to said film web as it passes through said apparatus.

9. The apparatus of claim 1, wherein said foam dispensing assembly includes a supply of first and second reactive components which, when mixed together, react to form said foam and said foam dispensing assembly further includes first and second foam dispensing nozzles respectively interconnected to said first and second reactive component supplies.

10. The apparatus of claim 5, wherein said film web driving means includes two counter-rotating brushes contacting exterior surfaces of said film web opposing panels, said rotation thereof providing an action which assists in mixing said first and second reactive components within said flexible mixing chamber.

11. The apparatus of claim 5, wherein said foam dispensing assembly nozzles have foam dispensing openings which are

positioned downstream of a centerline of said film web driving means.

12. The apparatus of claim 1, further including means for supporting said flexible mixing chamber walls, the flexible mixing chamber support means including two confronting support members disposed on opposite sides of said opposing film panels.

13. The apparatus of claim 10, wherein said brushes include a pair of opposed rollers having a plurality of individual brush elements extending therefrom along a predetermined length of each of said rollers.

14. The apparatus of claim 10, wherein said first and second foam dispensing nozzles are disposed between said two brushes.

15. The apparatus of claim 13, wherein said first and second foam-dispensing nozzles are disposed between said two brush rollers, said foam-dispensing nozzles including two respective foam-dispensing openings which are disposed proximate to a common centerline of said brush rollers.

16. The apparatus of claim 1 wherein said foam dispensing assembly two nozzles are aligned together so that two imaginary lines drawn along respective longitudinal axes of said two nozzles intersect.

17. The apparatus of claim 16, wherein said foam dispensing assembly two nozzles are aligned apart at approximately a 45° angle.

18. The apparatus of claim 1, further including means for sealing together common side edges of said opposing film panels.

19. The apparatus of claim 1, further including means for sealing together side edges of said opposing film panels which lie opposite said film web first edge.

20. The apparatus of claim 18, wherein said edge sealing means includes a pair of opposing edge seal members separated by an intervening sealing passage through which said film panels are driven by said film driving means, one of said pair of edge seal members providing a heated surface which contacts said opposing film panels and the other of said pair of edge seal members having means for cooling said opposing film panels.

21. The apparatus of claim 1, further including means for cutting said film web and forming a transverse seal to define leading and trailing edges of successive foam cushions.

22. The apparatus of claim 1, wherein said film web is folded upon itself to define a foldline joining said opposing film panels together along said film web first edge.

23. The application of claim 22, wherein said foam dispensing assembly is disposed proximate to said film web foldline.

24. The apparatus of claim 8, wherein said film tensioning means includes a first biasing member which selectively applies a first resistance force to said film supply and a second biasing member which selectively applies a second resistance force to a film guide member interposed in said film travel path between said film supply and said film web driving means.

25. The apparatus of claim 24, wherein said first and second biasing members are operatively connected together such that first and second resistance forces are respectively simultaneously applied to said film supply roll and said film guide members.

26. An apparatus for making foam cushions for packaging purposes wherein the foam cushions each include an exterior envelope filled with an expandable cushioning foam, the apparatus comprising: a continuous web of envelope-forming material folded upon itself to define two opposing envelope panels, each of the envelope panels having confronting interior faces adjoining each other

and exterior faces disposed on sides of said envelope panels opposite said interior faces; a cushion-forming station wherein said envelopes are partially filled with an expandable cushioning foam; means for advancing the continuous web of envelope-forming material to said cushion-forming station including a pair of counter-rotating brushes, the brushes being spaced apart from each other to define a nip therebetween, the nip providing a passage through said web advancing means which receives said continuous web, said brushes applying a driving force to said continuous film web on said exterior faces of said opposing panels thereof; cushioning foam dispenser means disposed adjacent said web advancing means and including first and second foam dispensing nozzles interposed between said brushes at said nip thereof; first and second supplier of reactive foam components which, when reacted together with each other, form an expandable cushioning foam; means interconnecting said first and second reactive foam component supplies respectively with said first and second foam-dispensing nozzles such that said first and second reactive foam components may be discharged into said envelope between said brushes, said interior faces of said continuous web cooperating together to define a flexible mixing chamber supported in part by said web advancement means wherein said first and second reactive foam components are mixed together after discharge from said first and second foam-dispensing nozzles, and said

apparatus further includes means for forming first, second and side seals in said advancing continuous web to define said foam cushion envelope.

27. A foam cushion-making apparatus as defined in claim 26, wherein said opposing envelope panels initially define interior walls of said flexible mixing chamber at said nip and subsequently define exterior walls of said foam cushions downstream of said nip.

28. A foam cushion-making apparatus as defined in claim 26, wherein said first and second foam-dispensing nozzles are interposed between said opposing envelope panels, and said foam-dispensing nozzles include foam dispensing openings positioned approximately at a centerline of said nip.

29. A foam cushion-making apparatus as defined in claim 27, wherein said first and second foam-dispensing nozzles are aligned such that first and second imaginary lines drawn along the respective longitudinal axes thereof intersect.

30. A foam cushion-making apparatus as defined in claim 29, wherein the intersection of said first and second imaginary lines does not occur upstream of said nip.

31. A foam cushion-making apparatus as defined in claim 26, wherein said brushes include brush rollers, one of said

brush rollers being a driven roller and the other of said brush rollers being an idler roller.

32. A foam cushion-making apparatus as defined in claim 26, wherein said foam dispensing nozzles are interposed between said brushes and proximate to a folded edge of said continuous web.

33. A foam cushion-making apparatus as defined in claim 26, further including a web guide roller interposed between said web supply and said web advancing means, the web guide roller including means operatively connected to said web for moderating tension in said continuous web.

34. An apparatus for making foam cushions wherein the foam cushions include a mass of expandable foam held within an outer plastic film bag, the apparatus comprising: a supply of bag film, the bag film supply including two continuous webs of bag film defining two opposing bag film panels, means for driving said opposing bag film panels along a bag film feedpath of said apparatus, a foam dispensing assembly disposed in said bag film feedpath, said bag film driving means driving said opposing bag film panels on opposite side of said foam dispensing assembly, support members disposed exterior of said bag film opposing panels defining a passage aligned with said bag film feedpath in the vicinity of said foam

dispensing assembly, said opposing bag film panels defining a flexible mixing chamber at said foam dispensing assembly and immediately downstream thereof, said opposing bag film panels defining walls of said flexible mixing chamber when said opposing bag film panels are interior of said apparatus and defining outer walls of said foam cushions exterior of said apparatus.

35. An apparatus for producing protective foam cushions wherein the foam cushions include a mass of expandable foam held within an outer plastic film bag, the apparatus comprising: a supply of bag film in the form of a continuous film web having two opposing film panels disposed along the length of said web in face-to-face contact, means for driving said film web along a feedpath of said apparatus, a foam dispensing assembly disposed in said feedpath and interposed between said opposing film panels, said film driving means driving said opposing film panels on opposite sides of said foam dispensing assembly, the apparatus including at least two confronting supports disposed exterior of said film opposing panels, said supports defining a film passage proximate to said foam dispensing assembly and aligned with said feedpath, said opposing film panels defining a flexible mixing chamber around said foam dispensing assembly and within said supports, said opposing film panels defining walls of said flexible mixing chamber when said opposing film panels are interior of said

apparatus and defining outer walls of said foam cushions exterior of said apparatus.

36. The apparatus of claim 20, wherein said heated surface is heated by a continuous flow of heated air and said apparatus includes means for periodically interrupting the flow of heated air to thereby create an unsealed portion in said edge seal to serve as a vent which permits the escape of foam reaction gasses.

37. A foam cushion-making apparatus as defined in claim 26, wherein said first and second seals are formed in said web in directions transverse to the direction of travel of said web.

38. A foam cushion-making apparatus as defined in claim 26, wherein said side seals are formed along longitudinal edges of said web.

39. A foam cushion-making apparatus as defined in claim 26, wherein said means for forming said side seals includes a pair of clamping members which extend over a side edge of said web, one of the clamping members including means for heating said web side edge and the other of said clamping members including means for cooling said web edge.

40. A method for forming protective foam cushions in which the foam cushions include a mass of expandable foam enclosed within an outer plastic film, the method comprising the steps of:

providing a supply of film in the form of a continuous web of film;

providing a foam component dispensing assembly interconnected to two sources of reactive foam components which, when mixed together, react to form an expanding foam;

advancing said web of film across the foam dispensing assembly in a manner such that: two opposing film panels are defined in face-to-face contact along the length of said web, and said foam dispensing assembly is interposed in an interior space between said web opposing film panels;

dispensing said two foam components from said foam component dispensing assembly into said web opposing film panel interior space;

providing, on opposite sides of said web opposing film panels and in proximity to said foam dispensing assembly, means for supporting said web opposing film panels, whereby mixing of said two foam components occurs entirely within said web opposing film panel interior space and downstream of said foam component dispensing assembly.

41. The method of claim 40, wherein said opposing film panel support means includes a pair of rotating brushes.

42. The method of claim 40, wherein said opposing film panel support means includes a pair of pliable rotating rollers.

43. The method of claim 42, wherein said pliable rollers include a pair of brush rollers.

44. The method of claim 40, wherein said opposing film panel support means includes a pair of rigid support members.

45. The method of claim 40, including the further steps of:

dispensing said two foam components from said foam component dispensing assembly in said opposing film panel interior space proximate to a folded edge of said web;

cutting and sealing web of film in a direction transverse to the direction of travel of said film web to define leading and trailing seals in said web for successive foam cushions.

46. The method of claim 40, wherein said web two opposing film panels are joined together along a first common longitudinal edge of said web and said method includes the further step of sealing said web two opposing film panels together along a second longitudinal edge of said web spaced apart from said web first edge by applying

heat to said web opposing film panels proximate to said second edge.

47. The method of claim 46 including the further step of periodically interrupting said application of heat to define a unsealed portion of said second edge which acts as a vent to permit foam reaction gases to escape from said web opposing film panel interior space.

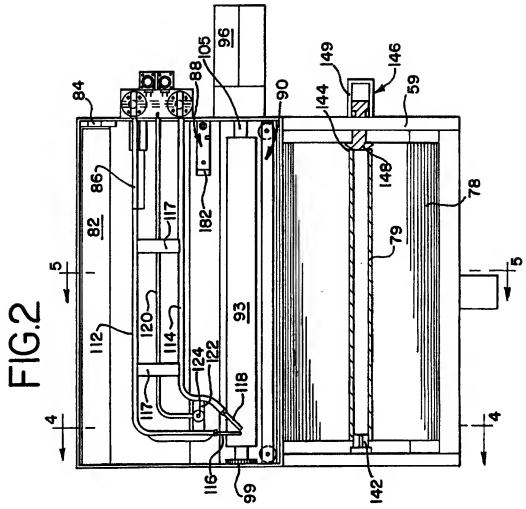


FIG.2

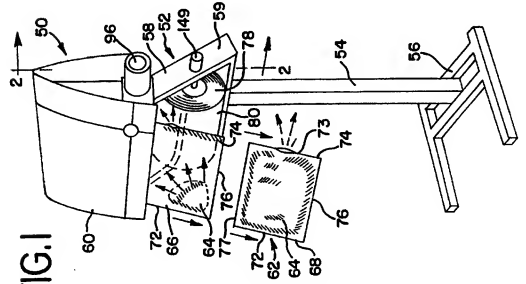


FIG.1

FIG. 3

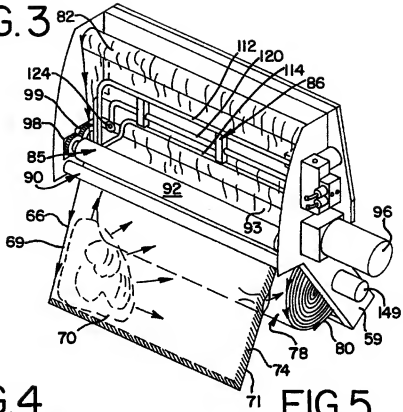


FIG. 4

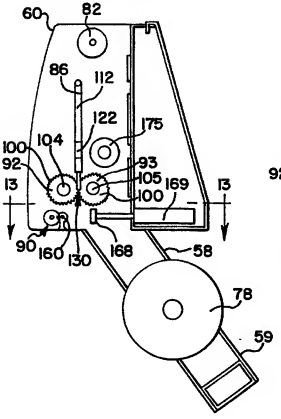


FIG. 5

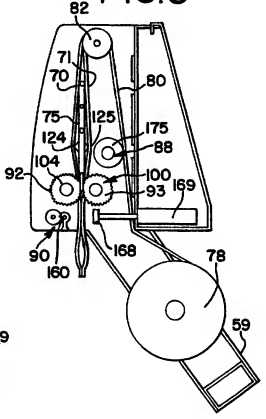


FIG.6

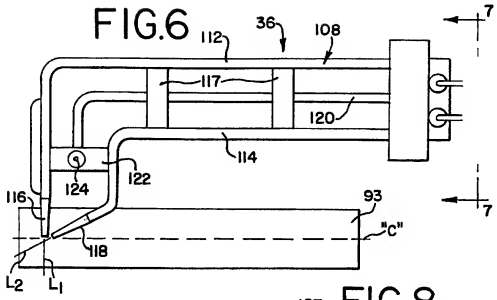


FIG.7

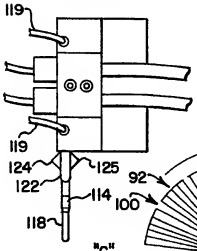


FIG.8

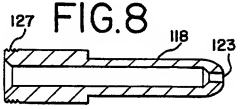


FIG.9

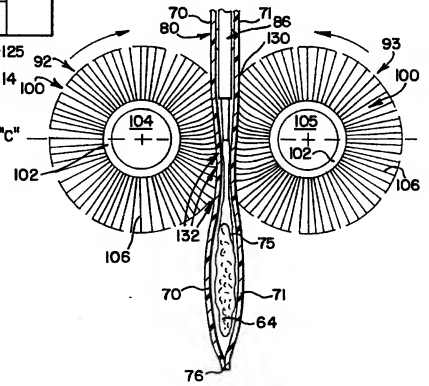


FIG.10

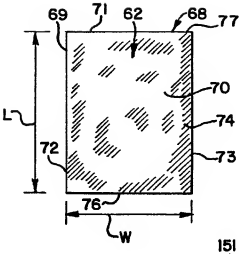


FIG.11

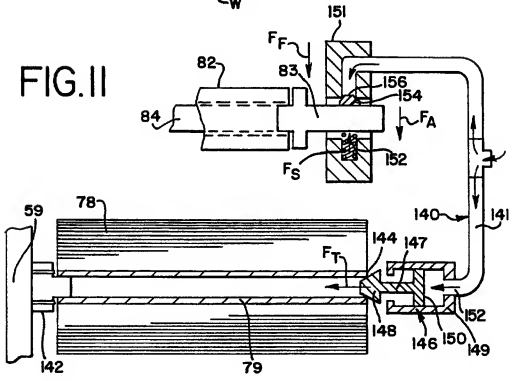
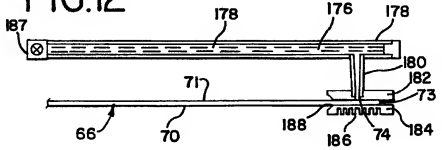


FIG.12



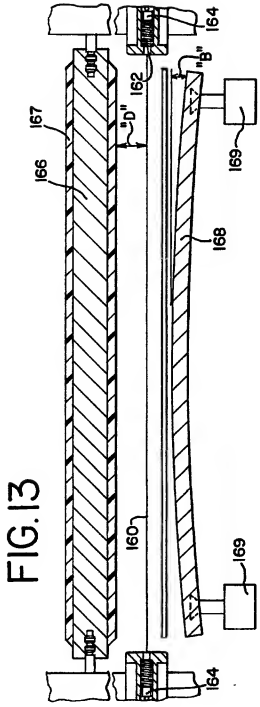


FIG. 13

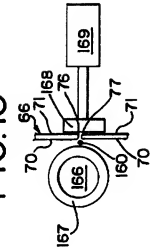


FIG. 15

FIG. 14

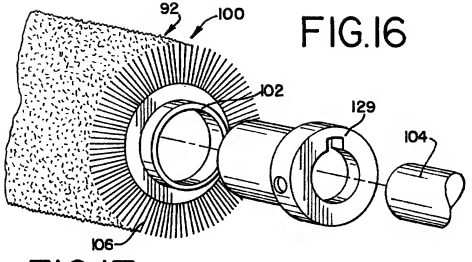


FIG.16

FIG.17

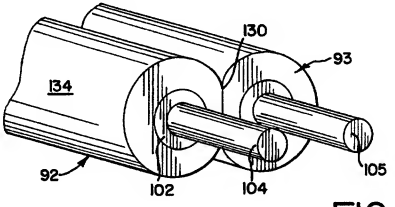


FIG.18

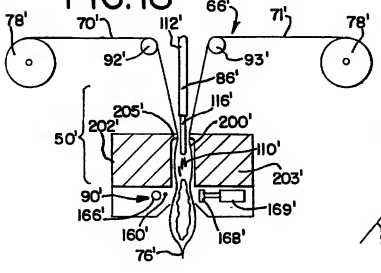
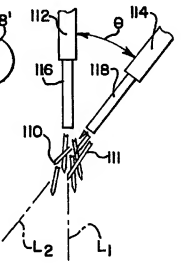


FIG.19



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/09727

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B65B 9/06, 23/00, 55/20
US CL :53/ 122, 237, 451, 472, 474, 551
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 53/ 122, 237, 238, 239, 423, 450, 451, 472, 474, 551, 552, 561

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,999,975 A (WILLDEN ET AL) 19 March 1991, see entire document.	1-3,5-9, 12, 18, 19, 21-23, 35, 40, 42, 44-47
X	US 4,938,007 A (SPERRY) 03 July 1990, see entire document.	34
A	US 5,335,483 A (GAVRONSKY ET AL) 09 August 1994, see entire document.	1-47
A	US 5,149,065 A (WILLDEN ET AL) 22 September 1992, see entire document.	1-47
A	US 5,027,583 A (CHELAK) 02 July 1991, see entire document.	1-47

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INTERNATIONAL SEARCH REPORT

International application No.
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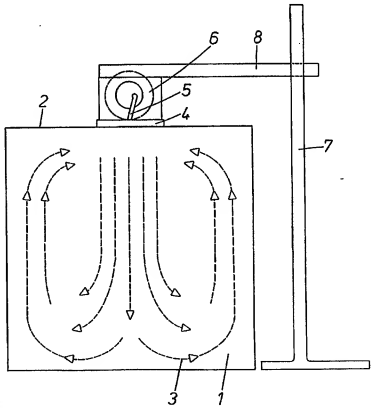
(54) Title: A METHOD AND AN APPARATUS FOR VIBRATING A LIQUID ENCLOSED IN AN ASEPTIC BAG

(57) Abstract

The invention relates to method and an apparatus for vibrating the contents in an aseptic bag (1), in that a device for a regular, varied pressure change is applied on the outer wall side (2) of the bag (1). The pressure change applied on the outside (2) of the bag (1) propagates to the contents of the bag (1) and gives rise to liquid flows in the contents. The device may consist of a diaphragm (4) which abuts against the outside (2) of the bag (1) and moves reciprocally. Alternatively, the device may consist of a bowl (9) which abuts in airtight fashion against the wall (2) of the bag (1). The bowl (9) is connected to a vaccum pump. By varying between vacuum and excess pressure, a pressure change will be obtained against the outside (2) of the bag (1). The bowl (9) may be of such size that a part of the wall (2) of the bag (1) is sucked into the bowl (9) when the bowl (9) is placed under vacuum.



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A METHOD AND AN APPARATUS FOR VIBRATING A LIQUID ENCLOSED IN AN ASEPTIC BAG

TECHNICAL FIELD

The present invention relates to a method of vibrating a liquid enclosed in an aseptic bag. The present invention also relates to an apparatus for carrying the method into effect.

BACKGROUND ART

In the handling of liquid- or pumpable foods, such as, for example fruit juices, it is normal to employ large bags, so-called bulk packages, which are aseptic and which permit an aseptic filling, storage and emptying of the contents of the bag. One such bag with its aseptic filling and emptying valve is described in Swedish Patent Specification SE 448 444. These aseptic bags may, for example, be employed in the preparation of orange juice concentrate, which often takes place in the country where the fruit growing is located. The ready-treated juice concentrate is filled aseptically into a large aseptic bag of the single-use disposable type. The juice concentrate may then be transported to a consumer country which is not normally the same as the producer country. On arrival in the consumer country, the juice concentrate may be emptied aseptically and packed direct, or alternatively be mixed or diluted in a refining process and thereafter be heat treated.

However, while the juice concentrate (or some other liquid food) is stored and transported in the aseptic bag, a certain sedimentation of the product takes place, in particular if the product contains fibres. In order to reconstitute a homogenous mixture, the practice hitherto has been to return the contents of the bag to a tank where, either separately or together with the contents from other bags, it is mixed together. In the case when the intention is to empty the contents of the bag aseptically and pack the contents without interjacent heat treatment, it has proved difficult to obtain the desired homogeneity of the mixture. Providing the bag with an agitator offers difficulties, given the aseptic demands which are in place, at the same time as it would be expensive given that the bags are of the single-use disposable type.

OBJECTS OF THE INVENTION

One object of the present invention is to realise a method of mixing the contents of the bag without the bag being opened and without the aseptic condition being jeopardised.

A further object of the present invention is that this method and the apparatus for carrying the method into effect are simple and economical and may be employed for different sizes of bags occurring on the market.

SOLUTION

These and other objects have been attained according to the present invention in that the method of the type disclosed by way of introduction has been given the characterizing feature that a device is applied on the outer wall side of the bag so as to give a regular, varied pressure change which propagates through the wall of the bag to the contents enclosed in the bag.

Preferred embodiments of the present invention have further been given the characterizing features as set forth in the appended subclaims.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The present invention will now be described in greater detail hereinbelow with reference to the accompanying Drawings, in which:

Fig. 1 shows a first embodiment of the present invention;

Fig. 2 shows a second embodiment of the present invention; and

Fig. 3 shows a third embodiment of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

The method and the apparatus according to the present invention are intended for a large aseptic bag 1 of the single-use disposable type. The bag 1 normally consists of two united parts manufactured from a plastic material or a material laminated from different plastic layers. The bag 1 is further provided with an aseptic filler valve (not shown) and a likewise aseptic emptying valve (not shown). Alternatively, the same valve may be employed for both filling and emptying. The bag 1 is filled aseptically with a liquid or pumpable food such as, for example, orange juice or a concentrate of the juice. The contents of the bag 1 are stored and subsequently transported in this manner, which may take place over a lengthy period of time.

During the storage, the contents in the bag 1 will sediment and separate into layers or strata. If the contents of the bag 1 are to be further treated, the contents are moved over to a tank and agitated to make a homogenous mixture. But if the intention is to transfer the contents direct and under aseptic conditions to some form of filling machine, the intention is to obtain a homogeneous mixture in the bag 1 before the contents of the bag 1 are passed on further.

Fig. 1 shows a bag 1 with its contents of liquid food. The bag 1 is secured in a frame (not shown) and is ready for emptying. Before emptying, the contents of the bag 1 are mixed by means of a method according to the present invention in which the outer wall side 2 of the bag 1 is subjected to regular, varying pressure changes, these pressure changes propagating through the wall 2 of the bag 1 into the liquid enclosed in the bag 1. The propagation of the pressure changes within the bag is shown by means of arrows 3. The vibration of the liquid enclosed in the bag 1 takes place entirely without direct contact between the device for realising the pressure change and the enclosed liquid.

The device for realising the pressure changes necessary for the reconstituting mixing operation consists, in Fig. 1, of a diaphragm 4, preferably a rubber diaphragm, which is caused to reciprocate at right angles to the wall side 2 of the bag 1. The diaphragm 4 must abut against the outer wall side 2 of the bag. The movement can, for example, be realised in that the diaphragm 4, via a crankshaft 5, is connected to some form of prime mover, such as, for example, an electric motor 6 with a gearbox or an eccenter. The rubber diaphragm 4 and its prime mover 6 are secured in a frame 7 which has a vertically adjustable arm 8. The adjustable arm 8 makes it possible for the apparatus to be employed for different sizes of bags 1 occurring on the market.

The reciprocating movement of the diaphragm 4 implies that, when the diaphragm 4 moves in towards the bag 1, a pressure is propagated in through the wall 2 of the bag 1 into the contents of the bag 1, giving rise to a liquid flow in the contents which is directed away from the diaphragm 4. When the diaphragm 4 retracts, the liquid will be sucked in from the sides of the bag 1 in order to compensate for the displacement of liquid which has taken place from the diaphragm 4. By repeating this reciprocating movement of the diaphragm 4, liquid flows 3 will thus be created in the liquid enclosed

in the bag 1, with the result that the liquid is vibrated and mixed to a homogeneous product which may thereafter be emptied aseptically and packed direct under aseptic conditions.

Figs. 2 and 3 show other embodiments for realising the requisite, regular varying pressure changes. In both cases, the pressure change is realised using air, from vacuum to excess pressure. The embodiments in Figs. 2 and 3 are gentler on the bag 1 than the embodiment in Fig. 1 which presupposes a mechanical action on the outer wall 2 of the bag 1.

The embodiment described in Fig. 2 has an airtight bowl 9 which abuts against the wall side 2 of the bag 1. The airtight bowl 9 has an inlet 10 and an outlet 11 which are connected to a vacuum pump (not shown). By evacuating, and alternatively supplying air to the bowl 9, a pressure change will be obtained against the outer wall side 2 of the bag 1, which gives the above-described liquid flows 3 which vibrate and mix the liquid contents in the bag 1.

The embodiment described in Fig. 3 also displays an airtight bowl 9 which abuts in airtight fashion against the outer wall side 2 of the bag 1. The airtight bowl 9 in Fig. 3 is somewhat larger than the bowl in Fig. 2, which permits a movement of the wall 2 of the bag 1. The airtight bowl 9 has an inlet 10 and an outlet 11 which are connected to a pump (not shown) which may both evacuate air out of the bowl 9 and also supply air to an excess pressure in the bowl 9. By varying the prevailing state in the bowl 9, a pressure change will be obtained ranging from vacuum to excess pressure, which will cause the wall 2 of the bag 1 to vary between an inner position 12 and an outer position 13. In other words, the wall side 2 of the bag 1 is caused to be sucked into the bowl 9 when the bowl 9 is under vacuum. In order to obtain a sufficient movement of the wall 2 of the bag 1, the bowl should be approx. 30 cm high and have a radius which approximately corresponds to its height.

The bowl 9 may alternate between vacuum and normal air pressure, there being created a suction intake of the wall 2 of the bag 1 and alternatively a smoothening-out of the wall surface 2. It is also possible to vary the bowl 9 so that it has one extreme position with vacuum and a second extreme position with excess pressure. In this case, the wall side 2 of the bag 1 varies between being sucked into the bowl 9 to bulging in towards the centre of the bag 1.

The embodiment described in Fig. 3 may be particularly suitable for more viscous products, since it is possible using this method to achieve a greater movement in the aseptic bag 1. In order to make room for this greater movement, it may be necessary to leave a slight head space in the bag 1 during filling of the aseptic bag in order to avoid unnecessarily heavy loading on the wall 2 of the bag 1.

As will have been apparent from the foregoing description, the present invention realises a simple and economical method of vibrating the liquid enclosed in an aseptic bag 1, such that liquid flows 3 arising in the liquid will mix the liquid without the bag 1 needing to be opened. The method and the apparatus for carrying the method into effect entail that the treatment of the contents of the bag 1 takes place from the outer wall side 2 of the bag 1 and that the contents, after the vibration, may be emptied entirely aseptically for further transport, for example to an aseptic filling machine.

The present invention should not be considered as restricted to that described above and shown on the Drawings, many modifications being conceivable without departing from the scope of the appended Claims.

WHAT IS CLAIMED IS:

1. A method of vibrating a liquid enclosed in an aseptic bag (1), characterized in that a device is applied on the outer wall side (2) of the bag (1) for giving a regular, varied pressure change which propagates through the wall (2) of the bag (1) to the liquid enclosed in the bag (1).

2. The method as claimed in Claim 1, characterized in that the pressure change gives rise to liquid flows (3) in the liquid enclosed in the bag (1).

3. The method as claimed in Claim 1, characterized in that the pressure change is realised by means of a diaphragm (4) abutting against the wall (2) of the bag (1), the diaphragm being caused to reciprocate at right angles to the wall side (2) of the bag (1).

4. The method as claimed in Claim 1, characterized in that the pressure change is realised by means of an airtight bowl (9) abutting against the wall (2) of the bag (1), said bowl (9) being connected to a vacuum pump so that air is evacuated from the bowl (9), and alternatingly air is supplied to the bowl (9).

5. The method as claimed in Claim 4, characterized in that the airtight bowl (9) is designed such that, when air is evacuated from the bowl (9) the wall of the bag (1) will bulge into the bowl (9), and alternatively when air is supplied to the bowl (9), the wall (2) of the bag (1) will bulge out from the bowl (9).

6. The method as claimed in Claim 5, characterized in that the bag (1) is filled allowing a head space so as to make room for the bulging movements of the wall (2).

7. An apparatus for vibrating a liquid enclosed in an aseptic bag (1), characterized in that a device disposed to give rise to regular, varying pressure changes is applied to the outer wall side (2) of the bag (1).

8. The apparatus as claimed in Claim 7, characterized in that said device consists of a diaphragm (4) abutting against the wall (2) of the bag (1) and disposed to reciprocate at right angles to the wall side (2) of the bag (1).

9. The apparatus as claimed in Claim 7, characterized in that said device consists of an airtight bowl (9) abutting against the wall (2) of the bag (1), said bowl being provided with inlet (10) and outlet (11) conduits, connected to a vacuum pump.

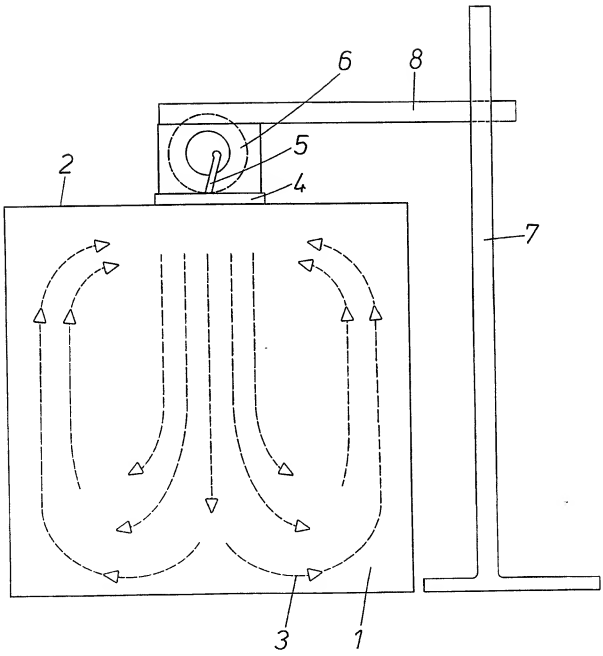

Fig.1

212

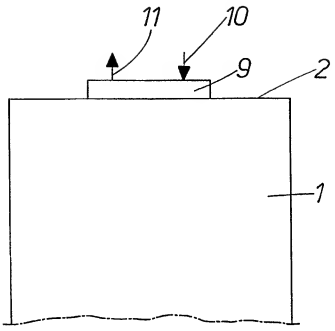

Fig.2

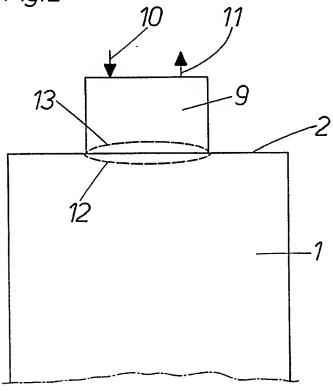

Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 97/02163

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B01F 3/08, B01F 11/00
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0695575 A2 (HARTMANN, H.), 7 February 1996 (07.02.96), page 1, line 19 - line 42; page 4, line 23 - line 30, figures 5a,5b --	1-3,7,8
X	US 3819158 A (A.N. SHARP ET AL), 25 June 1974 (25.06.74), column 1, line 3 - line 57; column 2, line 10 - line 41, figures 1,2 -- --------	1-3,7,8

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Information on patent family members

02/03/98

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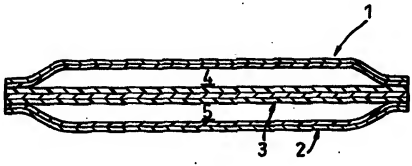

(57) Abstract

A multicompartment sachet comprises a first sheet member (1) which forms one outer face of the sachet, a second sheet member (2) which forms the other outer face of the sachet, one or more dividing sheets (3) of the same size and shape as the first and second sheet members (1, 2), said one or more dividing sheets (3) being sealed between the first and second sheet members (1, 2) around the periphery thereof to provide separate compartements (4, 5) within the sachet.

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PACKAGING

The present invention relates to a multicompartment pack for containing two or more incompatible ingredients and means for manufacturing such a pack.

Many products are sold in sachet form. A sachet form of packaging has many advantages. Sachets are cheap to make, provide ease of access to the contents in a single dose form whilst providing a tamper-evident and leak proof container for the product prior to use. As many products may be volatile, sachets also provide closed packaging which can be opened only once, immediately prior to use. However many formulations are unsuitable for presentation in a single sachet as they contain incompatible ingredients which have to remain separated prior to use.

Conventional twin sachets are no more than single sachets joined via a piece of web. They require the user to open each sachet separately and mix the ingredients correctly to form the resultant product. This may involve undue dexterity or skill and need instructions printed on the sachet in a suitable language. It is easy for users of such twin sachets to use the contents of only one compartment so providing an incorrect or incomplete dose. It is difficult to manufacture sachets with multiple internal compartments which dispense their contents through a single orifice.

There is a need to provide a cheap and easy method of making a simple, sealed sachet pack containing two or more separate compartments for separating incompatible ingredients which forms a product on opening the sachet without requiring skill from the user and which appears to the user as a single sachet.

The applicant has developed such a sachet and methods of manufacturing it. The present invention provides a multicompartment sachet comprising

a first sheet member which forms one outer face of the sachet

a second sheet member which forms the other outer face of the sachet

one or more dividing sheets of the same size and shape as the first and second sheet members, said one or more dividing sheets being sealed between the first and second sheet members around the periphery thereof to provide separate compartments within the sachet.

The first and second sheet members may be manufactured from a laminate comprising one layer which is, for example, of a metal eg aluminium foil and a layer which is of a heat-sealable plastics material. The laminate which is used for the first and second sheet members may be the same or different. Usually the first and second sheet members will be the same. In the sachet the heat-sealable plastics material is on the inside forming the outer wall of the outermost compartments. The laminate from which the first and second sheet members are manufactured may have additional layers, eg of a plastics material or paper. Said additional layers will be on the outside of the completed sachet providing strength and/or a suitable surface to which product information and/or directions for use can be applied. During continuous manufacture and filing of the sachet the first and second sheet members may be fed into the manufacturing/filling machine as separate webs or a single web may be folded to provide the first and the second sheet members.

The dividing sheets may be manufactured from a single sheet of a plastics material or from a laminate which has a plastics material on both of its outer surfaces. The plastics material must be one that is heat sealable to the plastics material(s) of the first and second sheet members to provide the seal around the periphery. When the dividing sheet is a laminate it may comprise a central layer for example a metal foil having layers of the plastics material (which may

be the same or different) on its outer faces. Preferably there is a single dividing sheet so that the number of compartments in the sachet is two.

Suitable heat sealable plastics materials include polyolefins such as polyethylene or polypropylene, nylon, polyvinylchloride or polystyrene.

The term laminate as used herein embraces multilayer sheets in which the layers are preformed and then assembled together or in which one or more layers have been coated onto a preformed substrate.

The sachet may be provided with means to ensure that the consumer can open all the compartments at the same time enabling the contents of all the compartments to be emptied out together. This means may comprise a line of weakness across the sheet members and the dividing sheets to enable the consumer to tear the sachet along the line of weakness to simultaneously open all the compartments. Alternatively a notch may be formed in the side of the sachet to provide a starting point for the tear made when the consumer opens the sachet. As an alternative to tearing, implements such as scissors may be used to open the sachet.

In accordance with a further aspect of the present invention, there is provided a method of producing multicompartment sachets on a continuous production line comprising the steps of:

(a) folding an outer web about a longitudinal axis in a V-shape;

(b) inserting one or more dividing webs in between the arms of the V with one longitudinal edge contacting the fold line of the folded outer web;

(c) guiding the outer and dividing webs to a forming station whilst maintaining their relative positions;

(d) joining the dividing web and the two arms of the folded outer web along the foldline of the outer web and along two spaced lines transverse to the direction of movement to define a plurality of fluid retaining pockets, the pockets being open along a side of the webs parallel to the direction of movement;

(e) moving the webs so that they pass horizontally through a filling station with the unsealed side of the pockets facing upwards;

(f) filling each pocket through the open side with a fluid product from a filling means at the filling station;

(g) sealing the top of all the pockets to produce a closed sachet comprising a plurality of internal compartments containing said fluid products ; and

(h) separating the filled sachets from the web.

In accordance with a further aspect of the present invention there is provided a method of producing multicompartment sachets on a continuous production line which comprises the steps of

(a) positioning a first outer web, a second outer web and one or more dividing webs such that the sides of the webs which are parallel to the direction of movement are aligned;

(b) guiding the webs to a forming station whilst maintaining their relative positions;

(c) joining the outer webs and the dividing webs along the said sides of the webs and across the webs transverse to the direction of travel to define a

plurality of fluid retaining pockets, the pockets being open along a side transverse to the direction of travel of the webs;

(d) moving the webs so that they pass vertically through a filling station with the unsealed side of the pockets facing upwards;

(e) filling each pocket through the open side with a fluid from a filling means at the filling station;

(f) sealing the top of all the pockets to produce a sachet comprising a plurality of internal compartments containing said fluid products; and

(g) separating the filled sachets from the webs.

The sachets of the present invention have various advantages. A sachet with two or more compartments permits presentation of products comprising two or more incompatible ingredients which can be separated until use. Thus the shelf life and/or quality of products may be extended. Products can be formed in situ just before use, so formulations which would not normally be stable or acceptable as a commercial product can be stored as separate components in the sachet. The sachets are particularly useful for carrying products where mixing of different ingredients produces a benefit to the consumer. The sachets are also useful for products where two ingredients are compatible when mixed for a short time but which would react if mixed over a significant period of time. The compositions in each compartment may be any suitable fluid e.g. powders and/or liquids. If the compartments comprise a powder and a measured volume of liquid the sachet may provide a drink where water supplies are limited or contaminated or may provide a product for rehydration therapy

Examples of products to be contained in the multicompartment sachets of the present invention include:

two part adhesives for example epoxy or cyanoacrylate adhesives where two components are stored in separate compartments in the sachet and are mixed immediately prior to use;

hair dyes where two components are stored in separate compartments in the sachet and are mixed immediately prior to use to generate the desired colour;

effervescent compositions in which the effervence is produced by mixing the components of an effervescent couple (eg an acid and a carbon dioxide source such as a carbonate or bicarbonate salt) in which the components of the effervescent couple are stored in separate compartments in the sachet and mixed with a solvent, for example water immediately prior to use;

pharmaceutical compositions in which the components would be incompatible if stored together but which have a satisfactory shelf life if the components are stored in separate compartments in the sachet and are mixed immediately prior to use.

Examples of suitable pharmaceutical compositions are:

antibiotic formulations in which the powdered antibiotic is stored in one compartment of the sachet and a liquid carrier is stored in a second compartment. The antibiotic and liquid carrier are mixed immediately prior to use;

vitamin formulations in which the vitamins are stored in one compartment of the sachet and other components of the formulation which may cause degradation of the vitamins are stored in another compartment, for example ibuprofen and vitamin C;

controlled release formulations in which a drug component for immediate release is contained in one compartment and a second drug component, which may be the same as or different from the first drug component, in sustained release form is contained in a second compartment, for example an immediate release analgesic and a sustained release analgesic;

flavoured formulations in which some or all of the flavouring components are contained in one compartment and the other components of the formulation which may cause degradation of the flavouring components are contained in a second compartment;

combination formulations in which a first drug is contained in one compartment and a second drug, which may be incompatible with the first if they are stored together, is contained in a second compartment, for example ibuprofen and/or flurbiprofen and other actives such as codeine or pseudoephedrine;

skin care formulations in which active medicaments are contained in a suitable form in one compartment and carrier or diluent components are contained in a second compartment. The active medicament and carrier or diluent are mixed prior to use.

Sachets produced by the method of the present invention are opened by a single operation (e.g. tearing or cutting across one end of the sachet) to open both compartments at the same time. Thus when the sachet is opened the contents of each compartment can be dispensed together and mixed to form the desired product as each compartment is opened at the same time and mixing occurs as the compartments are emptied through the single orifice. Thus mixing is out of the control of the user which prevents the possibility of incorrect mixing or dosing. The end-user of the sachet will be unaware of the mixing of the contents of all the compartments on opening and will treat the sachet as if it were a conventional single chambered sachet.

The method of making these sachets has the advantage of using readily available conventional tools on a packaging production line which are modified simply and inexpensively to reduce the extra cost of manufacturing the new sachets. Sachets produced by the method described above use less material that would be required for conventional double or twin sachets which are joined side by side through a connecting web without a common inner wall.

Specific non-limiting embodiments of the invention will now be described as follows with reference to the drawings in which:-

Figure 1 is a cross-sectional view of one embodiment of a two compartment sachet according to the present invention.

Figure 2 is an enlarged cross-sectional view of a part of Figure 1.

Figure 3 is a plan view from above of a continuous production line used in one embodiment of a method according to the invention.

Figure 4 is plan view from above of a continuous production line used in a second embodiment of a method according to the invention.

Figure 5 is the same plan view of the line shown in Figure 4 at a different point in the cycle of sachet production.

Figure 6 is a schematic side view of apparatus for manufacturing two compartment sachets of the present invention.

The sachet shown in Figures 1 and 2 comprises a first sheet member 1, a second sheet member 2 and a dividing sheet 3. The sheet members 1, 2 and the dividing sheet 3 are sealed together around their periphery to provide two separate compartments 4, 5 to contain fluid products (not shown). The first sheet member 1 is a laminate comprising an outer layer 6 which may be a metal foil for example of aluminium and a heat sealable plastics layer 7, for example a polyolefin such as polyethylene. The second sheet member 2 is a laminate comprising an outer layer 8 which may be a metal foil and a heat sealable plastics layer 9. The outer layers 6, 8 and the plastics layers 7, 9 in

the first and second sheet member may be the same or different. The dividing sheet is a laminate of a central layer, for example a metal foil 10 having layers of heat sealable plastics layers 11, 12 on each face thereof. The plastics layers 11, 12 may be same or different and may be the same or different from the plastics layers 7, 9. The plastics layers 7 and 11 must be heat sealable to one another to form a fluid tight seal and must be compatible with the fluid product contained in compartment 4. Similarly the plastics layers 9 and 12 must be heat sealable to one another and compatible with the fluid product contained in compartment 5. The first and second sheet members may have additional layers (not shown) to provide strength to the sachets or a suitable surface to which product information and/or directions for use can be applied.

With reference to Figure 3, in a process to manufacture the sachets of the present invention, the sachet is formed by using two webs of material, one web (101) forming the first and second sheet members which are the outer walls of the sachet and the other web (103) forming the dividing sheet.

Both webs are fed continuously from reels (not shown). The outer web (101) is made from a laminate of a heat sealable plastics material, for example a polyolefin, coated on one side with an outer layer which may be a plastics material or a metal foil. The outer web is folded to make a V in transverse cross section, the heat sealable plastics material being on the inner side of the V. The outer web forms the outer walls of the sachet. On the production line the inside of the V is accessed from the top side only. The web (103) which is a central layer, for example, a metal foil coated with a heat sealable plastics material such as a polyolefin on both sides is fed between the folded outer web (101) with one longitudinal edge of the web 103 in contact with the fold in the outer web to divide the V into two sections. Two friction rollers (105) guide the inner web (103) into a central position.

The two webs (101,103) are fed horizontally into a forming station (107) into which are inserted several vacuum ports (108) which are adjusted to suit the shape required for the sachet. The vacuum ports (108) are connected through flexible tubes to a vacuum pump (not shown) which controls the lateral movement of the outer web (101) in the forming box. The inner web (103) is held in a central position within the forming box by the frictional rollers (105). In the forming box filler funnels (111) can enter the open side of the web from the top side. Either side of the forming box (107) and along the main axis of the production line are side jaws (109) which close and seal the webs (101, 103) together to define pocket(s) (112) in the webs (101 ,103) which will become a sachet.

At the forming station (107) two filling tubes (111) are positioned so then each can move above one of the two pockets (112) defined by those parts of the outer web (101) and the inner web (103) between the two sets of side sealing jaws (109). Each pocket (112) is filled with a different fluid ingredient from a respective filling tube (111) which are moved into the pocket whilst that part of the outer web (101) within the forming station (107) is held apart laterally by reduced pressure through the vacuum tubes (108).

After filling the pockets (112), the filling tubes (111) are retracted and the web is moved forward to advance the filled pockets (112) to the next station (113) where they are heat sealed along the open top edge. At the same time the vacuum at the forming station (107) is released and the jaws (109) are opened and returned to their initial position adjacent the forming station (107) for the next cycle.

The sachets may be provided with opening means at a further station (not shown) so both compartments must be opened simultaneously. For example the sachet can have a pre-stressed line of weakness across both compartments at one side or a notch adjacent one side of the sachet.

In this embodiment the production line may be circular and each station may be arranged around a turret. Alternatively the various station components (e.g. jaws (109) and filling funnels (11) may be moved linearly by reciprocal mounts so the production line may be arranged in a straight line.

A second process to manufacture the sachets of the present invention will now be described with reference to Figures 4 and 5 in which features similar to those in Figure 3 carry the same reference numerals and are not described again in detail.

The inner web (103) and outer web (101) are initially arranged as described for Figure 2 The base of the outer web (101) opposite the open end of the V passes over a heater (104) which heat seals the inner web (103) to the inside of the fold of the V-shaped outer web (101). A divider (105) (down-stream of the heater 104) which is movable along the longitudinal axis of the production line guides the inner web (103) and outer webs (101) towards the forming/filling station (107) and keeps the webs apart at the top of the V.

In Figure 4 the divider (105) has been moved forward towards a forming/filling station (107) in the direction of travel of the web. The divider (105) advances with the webs (101, 103) horizontally and shapes the pockets (112) at the forming/ filling station (107). The divider (105) guides the outer web (101) around the outside of filler tubes (111) and the guides the central inner web (103) between the tubes (111). As the divider (105) is retracted to the position shown in Figure 5 the two filler tubes (111) descend to a filling position inside the pockets (112).

The webs (101,103) are heated by laterally movable side heaters (109) to seal them together across the height. This seals the rear end of the pockets (112) and the beginning of the following pockets. Each of the pockets (112) is then

filled with fluid material. The filler tubes (111) are then withdrawn and the web advances to a sealing station so that the tops of the pockets (112) can be sealed by heater (115).

At a further station (not shown) a line of weakness may be added to the end of the sachet to facilitate opening. Then the completed sachet is cut from the end of the web. The cycle is repeated to produce the next sachet.

In the apparatus illustrated in Figure 6 a first outer web 201 passes over rollers 202, 203 which position the web 201 in a vertical plane. Similarly a second outer web 204 passes over rollers 205, 206 which position the web 204 in a vertical plane adjacent the web 201. A dividing web 207 is positioned between the first and second outer webs 201, 204. The webs 201, 204 and 207 are the same width. Means (not shown) simultaneously advance the three webs stepwise by the distance X as shown in Figure 6. When the webs are in the position shown in Figure 6 they are joined by a seal 208. The sides of the webs 201, 204, 207 are then sealed together along their side edges 209, 210 to form two pockets between the seal 208 and the seals formed along the side edges 209, 210. A filling tube 211 has its lower open end located in the upper open end of the pocket formed between the first outer web 201 and the dividing web 207. In a similar way a filling tube 212 (represented by dotted lines in Figure 6) has its lower open end located in the open end of the pocket formed between the second outer web 204 and the dividing web 207. The pockets are then each filled with a predetermined amount of a fluid material through the filling tubes 211, 212 respectively. The webs 201, 204, 207 are then moved on by the distance X and the seal 208 is made to enclose the fluid materials in the two compartments of the sachet which at this point is still attached to the webs. Cutting means (not shown) at 213 in Figure 6 then separate the lower most filled sachet from the webs. The stepwise advance of the webs is then repeated as each successive sachet is formed, filled, sealed and separated from the webs.

CLAIMS

1. A multicompartment sachet comprising

a first sheet member which forms one outer face of the sachet

a second sheet member which forms the other outer face of the sachet

one or more dividing sheets of the same size and shape as the first and second sheet members, said one or more dividing sheets being sealed between the first and second sheet members around the periphery thereof to provide separate compartments within the sachet.

2. A method of producing the multicompartment sachets of claim 1 on a continuous production line comprising the steps of:

(a) folding an outer web about a longitudinal axis in a V-shape;

(b) inserting one or more dividing webs in between the arms of the V with one longitudinal edge contacting the fold line of the folded outer web;

(c) guiding the outer and dividing webs to a forming station whilst maintaining their relative positions;

(d) joining the dividing web and the two arms of the folded outer web along the foldline of the outer web and along two spaced lines transverse to the direction of movement to define a plurality of fluid retaining pockets, the pockets being open along a side of the webs parallel to the direction of movement;

(e) moving the webs so that they pass horizontally through a filling station with the unsealed side of the pockets facing upwards;

(f) filling each pocket through the open side with a fluid product from a filling means at the filling station;

(g) sealing the top of all the pockets to produce a closed sachet comprising a plurality of internal compartments containing said fluid products ; and

(h) separating the filled sachets from the web.

3. A method of producing the multicompartment sachets of claim 1 on a continuous production line comprises the steps of

(a) positioning a first outer web, a second outer web and one or more dividing webs such that the sides of the webs which are parallel to the direction of movement are aligned;

(b) guiding the webs to a forming station whilst maintaining their relative positions;

(c) joining the outer webs and the dividing webs along the said sides of the webs and across the webs transverse to the direction of travel to define a plurality of fluid retaining pockets, the pockets being open along a side transverse to the direction of travel of the webs;

(d) moving the webs so that they pass vertically through a filling station with the unsealed side of the pockets facing upwards;

(e) filling each pocket through the open side with a fluid from a filling means at the filling station;

(f) sealing the top of all the pockets to produce a sachet comprising a plurality of internal compartments containing said fluid products; and

(g) separating the filled sachets from the webs.

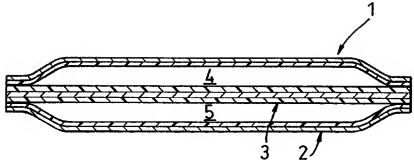

Fig. 1

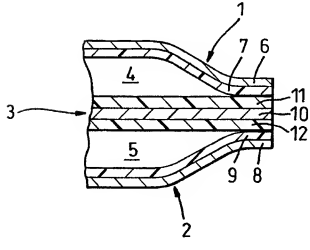

Fig. 2

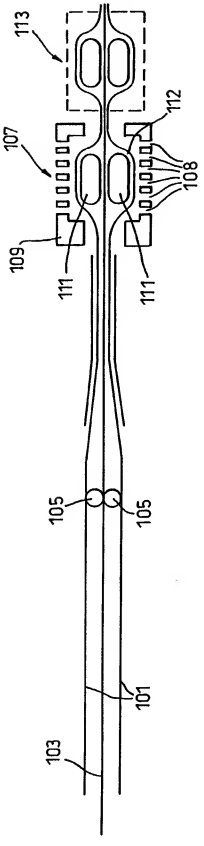

Fig. 3

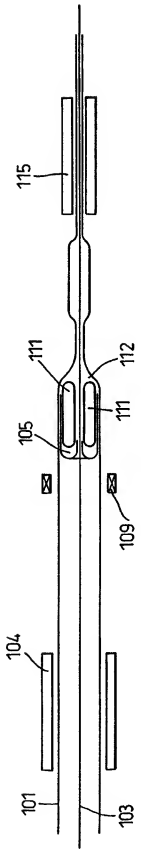
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Fig. 4

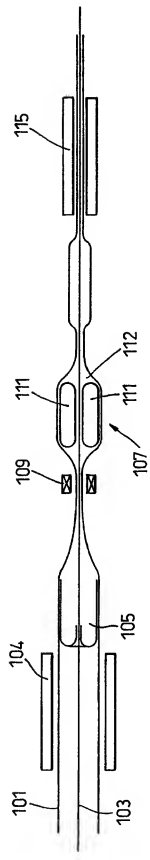
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Fig. 5

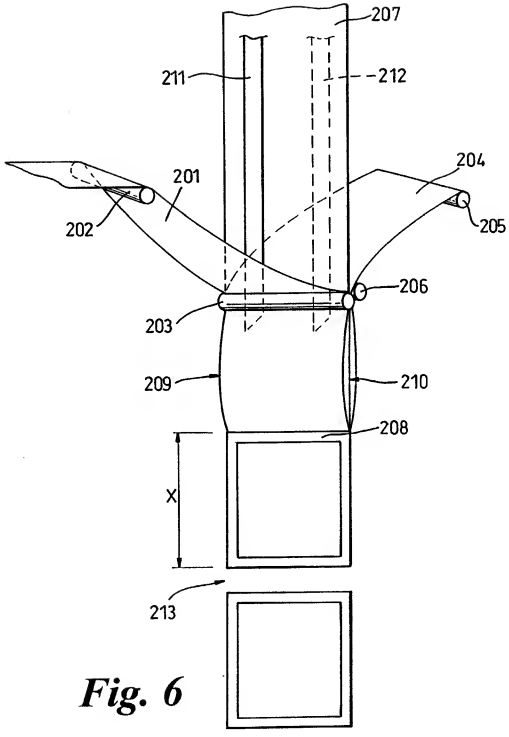

Fig. 6

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(54) A flavour bag

(57) A flavour bag suitable for imparting flavour into foods during the cooking process comprising:-
(i) an outer surround at least part of which is permeable to molten fat;
(ii) a first compartment within the surround, said compartment being adapted to contain edible fat; and
(iii) a second compartment within the surround, said compartment being adapted to contain a flavouring material such as herbs or spices,
wherein the first and second compartments share a common wall, at least part of which is permeable to molten fat. The bag may have only one compartment containing the edible fat and flavouring material.

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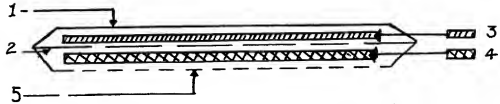

FIG 1

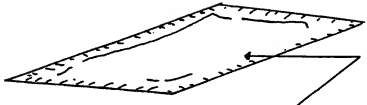

FIG2

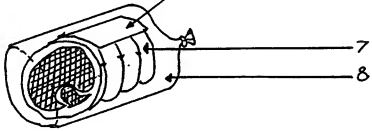

FIG3

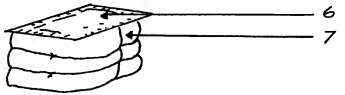

FIG4

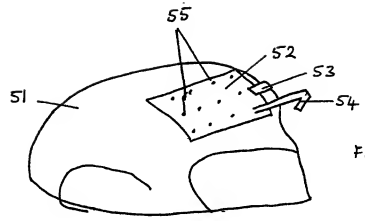

FIGURE 5

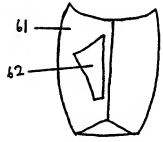

FIGURE 6

FIGURE 7

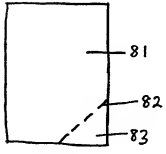

FIGURE 8

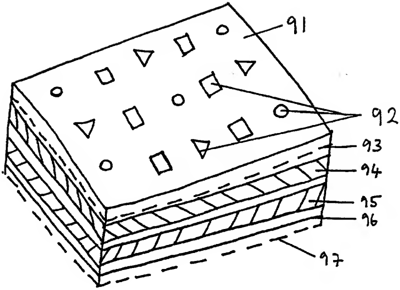

FIGURE 9

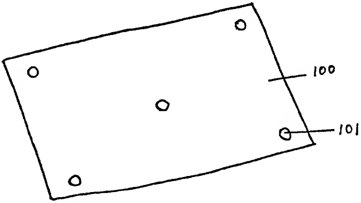

FIGURE 10

Flavour bag

Field of Invention

This invention relates to a flavour bag, particularly a flavour bag for imparting flavour into foods during the cooking process and in particular for use when roasting food.

Background to the invention

Cooks often experience difficulties in flavouring foods particularly in applying the correct amounts and proportions of flavourings that are required during the cooking process. For example, when roasting a joint of meat the cook may wish to apply flavourings such as herbs or spices to the meat. However, herbs applied directly to the meat may burn during the roasting process or may simply fall away from the meat so that the herbs must be frequently re-applied to the meat during roasting (for example by basting). This prevents a gradual, sustained release of the required amounts and correct proportions of flavours from the herbs into the meat and also leads to variation in the roasting temperature as the oven has to be opened to re-apply the herbs. Also, re-application of the herbs is inconvenient as well as difficult for inexperienced cooks. A further problem is that if it is desired to remove the flavouring material (for example herb pieces) from the food before serving this is difficult because the flavouring material often fragments and spreads out during the cooking process.

Another problem relates to applying the correct amounts and proportions of flavourings to pre-cooked food that still contains residual heat and also during re-heating or warming of pre-cooked food. For pre-cooked food the flavourings

required can differ significantly from those required during the initial cooking process and cooks often experience difficulties with this.

It is accordingly an object of the present invention to provide a flavour bag suitable for imparting flavour into foods during the cooking process which overcomes or at least mitigates one or all of the problems noted above.

Summary of Invention

According to the present invention, there is provided a flavour bag suitable for imparting flavour into foods during the cooking process, the bag containing edible fat and a flavouring material, such as herbs or spices, at least a portion of the outer layer of the bag being permeable to molten fat such that, during the cooking process, the fat in the bag melts and absorbs flavour from the flavouring material before permeating through the outer layer of the bag and into contact with the food being cooked. By placing the bag onto or into the food during the cooking process the invention allows the desired amounts and proportions of flavourings to be imparted into the food in a gradual, sustained manner. The flavour bag prevents the flavourings from falling away from the food during the cooking process and also reduces the risk of the flavourings burning. Further, the flavouring materials are retained within the bag and can easily be removed from the meat after cooking by simply removing the flavour bag.

It is also possible for the fat itself to be flavoured, for example, smoked bacon fat can be used. In this case it would not be essential to include other flavouring materials in the bag, such as herbs or spices, but rather the fat itself would flavour

the food. The flavoured fat would still be released over the food in a gradual, sustained manner thus facilitating the transfer of flavour into the food.

Advantageously, the flavour bag is of multilayer construction, comprising an outer layer and at least one intermediate layer, the intermediate layers being permeable to molten fat, the fat and the flavouring material initially being segregated between adjacent layers. As the fat melts during the cooking process it permeates through the layers and combines with the flavouring material. The molten flavoured fat then permeates through the outer layer of the bag and into contact with the food. Using the multilayer construction in this way gives the invention the advantage of imparting flavours into the food in a gradual manner which is sustained for a substantial period. This slow release process facilitates the transfer of flavours into the food.

In a preferred embodiment the bag is constructed from layers of material which is otherwise substantially impermeable to molten fat but which is made permeable by perforations. For example, the bag can be constructed from layers of metal foil which contains perforations.

In another preferred embodiment the outer layer of the bag is constructed from metal foil and the intermediate layer(s) are constructed from fibrous material. This has the advantage that the molten fat permeates through the fibrous material without the need for perforations to be made. Also, the fibrous material provides a fine mesh through which the fat permeates and such a fine mesh may be difficult to achieve using perforations. The outer metal layer ensures efficient conduction of heat to the contents of the bag.

The invention is also considered to encompass a flavour bag which has either no contents or contains only flavouring materials. This has the advantage that the cook is free to select the flavouring material(s) and or fat(s). Also, the bag could be stored for longer without the contents perishing. This type of flavour bag contains openings in order that materials can be placed in the bag and there are also means for sealing the bag. For example, when the outer layer of the bag is made from metal foil the sides of the opening(s) may be folded shut.

Description of the drawings

The invention will be further described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a cross section through a flavour bag.

Figure 2 is a perspective view of the base of a flavour bag.

Figure 3 is a perspective view showing a flavour bag applied to a joint of meat and where the flavour bag and meat are enclosed within a conventional roasting bag.

Figure 4 is a perspective view showing a flavour bag applied to a joint of meat.

Figure 5 is a perspective view showing a flavour bag applied to a chicken.

Figure 6 is a plan view showing a flavour bag applied to a chicken.

Figure 7 is a perspective view showing a flavour bag applied to a burger.

Figure 8 is a plan view of a flavour bag with a tear-off portion.

Figure 9 is a perspective view showing a flavour bag that has regions marked on it for perforation.

Figure 10 is a perspective view showing one layer of a flavour bag.

Description of preferred embodiments

Embodiments of the present invention are described below by way of example only. These examples represent the best ways of putting the invention into practice that are currently known to the Applicant although they are not the only ways in which this could be achieved.

As shown in the figures, the flavour bag 6 consists of a top layer 1 which is made of a material inherently impervious to molten fat for example, metal foil. The bag is of multi-layer construction, that is, it contains intermediate layers 2 which are either made from a material impervious to molten fat with perforations in it or from a material which is permeable to molten fat (such as a fibrous material). The bag contains edible fats 3 and flavouring material 4 which are segregated between adjacent layers of the bag. The flavouring material 4 for example, may consist of dried or otherwise dehydrated herbs and or spices. The edible fats 3 may also be themselves flavoured (although this is not essential) for example, smoked bacon fat can be used. The bottom layer 5 is either made of a material inherently impervious to molten fat with perforations in it or from a material that is permeable to molten fat.

The flavour bag is used to impart flavour into foods during the cooking process as described in the following example. As shown in figure 3 and figure 4 the flavour bag 6 is placed on the meat 7 or food which requires flavouring and together they are placed in the oven or other cooking device. The flavour bag and meat may also be placed within a conventional roasting bag 8 as shown in figure 3. As the cooking process heats the food it also melts the fat in the flavour bag. The molten fat passes through the intermediate layers (which either contain perforations or are made of molten-fat-permeable material) and combines with the flavourings. Finally

the flavoured molten fat passes through the material at the bottom of the flavour bag 5 and onto the food being cooked thus flavouring the food as it passes over it. The design of the bag promotes the slow release of the flavourings to allow the maximum effect on the food. This slow, sustained release of flavourings facilitates the transfer of flavour into the food. The bag also allows the flavouring material to be held on the food throughout the cooking process and enables the flavouring material to be removed from the food easily after cooking.

It is not essential that the outer layer of the bag and the intermediate layers are made from the same material. For example, the outer layer could be made of metal foil with perforations in it and the intermediate layers from fibrous material. Also, it is not essential that the bag contain several intermediate layers, one intermediate layer could be used. Another possibility is that the bag initially has no contents or contains only flavouring materials. The cook is then free to select the flavouring materials and or fats to be used. In this case the bag contains openings via which materials can be placed in the bag and there are also means to close these openings. For example, when the outer layer of the bag is made from metal foil the sides of the opening(s) may be folded shut.

It is also possible for the fat itself to be flavoured, for example, smoked bacon fat can be used. In this case it would not be essential to include other flavouring materials in the bag, such as herbs or spices, but rather the fat itself would flavour the food. The flavoured fat would still be released over the food in a gradual, sustained manner thus facilitating the transfer of flavour into the food.

Figure 5 shows how the flavour bag 52 is applied to a joint of meat 51 such as a chicken. The flavour bag 52 can either be placed on top of the chicken 51 as shown or it may be inserted between the skin of the chicken and the flesh. The flavour bag 52 has a cord 54 attached to it that is used both to secure the flavour bag to the chicken during the cooking process and also to aid removal of the bag from the food. The cord 54 can be of any length and is made from string, plastics material or any other suitable material. The cord 54 has a clip at one end to enable the cord to be clipped to the meat or other foodstuff. The clip can also be used to secure the flavour bag to a container that the food is placed in. For example, a roasting dish, casserole dish or other container. Figure 5 shows how the cord and clip 53 are used to clip the flavour bag 52 to the chicken. In this figure, the cord and clip are also shown in an extended position 54.

In the situation when the flavour bag 52 is inserted between the skin of the chicken and the flesh the upper surface of the flavour bag 52 preferably contains perforations 55. The cook pulls the skin away from the flesh and inserts the flavour bag into the position shown. During the cooking process the flesh can become stuck onto the outer surface of the flavour bag 52 which makes the bag difficult to remove. This can be avoided by providing lubrication between the outer layer of the bag 52 and the flesh. The perforations 55 allow fats or oils from inside the flavour bag to permeate out onto the outer surface of the bag and provide the necessary lubrication. Alternatively, if no perforations 55 are provided the cook places some fat or grease between the skin and the outside of the bag 52.

When perforations 55 are provided these can be positioned only over part of the top surface of the bag 52. The perforations 55 are arranged so that when the bag 52 is placed on the food as shown in figure 5 fats/oils which permeate out of the perforations during the cooking process flow down the outside of the bag and over

the food. This helps to retain the flavoured fats/oils on the food for as long as possible.

Different shapes of flavour bag are possible and this is advantageous for different types of food. By providing different shapes of flavour bag the food can be covered effectively by the bag without wasting the bag contents. It is not necessary to have regions of the bag that overlap the food. For example, figure 6 shows a flavour bag 62 that is shaped to cover the required region of a chicken 61 or other poultry bird. Figure 7 shows a round flavour bag 72 designed for use with a burger 71. Many different shapes of flavour bag can be formed for use with different food stuffs.

Figure 8 shows a flavour bag with a tear-off portion 83. In this case the flavour bag is rectangular and has a perforated or scored line 82 that allows the corner portion 83 to be torn-off by the cook. This allows the contents of the bag to be poured or squeezed out and used for a garnish or sauce. In this way the contents of the bag can be applied directly to the food. This can be done either before, during or after the cooking process.

It is also possible to use the flavour bag with pre-cooked food. For example it may be desired to flavour food as it is being re-heated or warmed. Also, it may be desired to flavour food that has recently been cooked and that still contains residual heat.

To flavour food as it is being re-heated or warmed the flavour bag is placed on or over the food and then the food is heated in any conventional way. For example, using an oven or a microwave oven. The flavour bag can be placed over food that is in a bowl or other container and the cord and clip can be used to hold the bag in place as previously described. For example, a bowl of rice can be re-heated and flavoured using the flavour bag. The flavour bag is placed over the bowl

of rice and the flavour and fat/oil permeates through the perforations in the bag and onto the food. By using different coloured flavourings the presentation of the rice or other food can also be improved. The coloured flavouring tends to reach areas of the food near the perforations in the bag so that different parts of the food are coloured/flavoured by different amounts. The food can then be mixed before serving to spread the colours/flavours more evenly and a pleasing presentational effect is achieved.

To flavour food that has recently been cooked and that still contains residual heat the flavour bag is placed over or in the hot food and left for a few minutes. For example, rice can be cooked and placed into a bowl whilst it is still hot. The flavour bag is then placed over the bowl of rice so that it is in contact with the hot rice. Heat from the rice warms the fats/oils in the flavour bag and these permeate out of the bag and over the food taking the flavourings with them.

To reduce manufacturing costs and time it is possible to make several flavour bags in a continuous sheet. This is done by forming layers of material according to the layer design for the bag and then stamping out the required shapes for the bags. The bags can be sealed by heat treatment or by using any other conventional means.

Once several bags are formed in a continuous length these can be separated into individual bags by the cook or alternatively may be left in units of two or more. This can help if it is desired to use the bags with a large surface area of food. For example, for several steaks lined up on a grill or barbecue a row of joined flavour bags can be placed over the steaks. The joins between the bags can be scored or perforated to make them easy to separate. It is also possible for the cook to use scissors or a knife to separate the bags.

Figure 9 shows a flavour bag that does not initially have any perforations in the outer layer. Instead the upper surface of the bag 91 has markings on it 92 which indicate regions where the cook can make perforations. The cook uses a sharp, pointed implement to make the perforations by pushing the implement through one of the marked regions 92 and all the way down through the bag. For example, a needle, cocktail stick, toothpick or other similar device can be used to perforate the bag. Different shapes and colours are used to mark out the regions 92 and instructions are provided to the cook about how many of these regions to perforate and when to do this. Instructions about which regions to perforate to achieve different strengths and amounts of flavouring are also given.

In this type of bag there may be a layer of paper membrane 93 just underneath the top surface of the bag 91. This paper membrane 93 tends to re-seal itself after the cook has made the perforations and does not rip so that large tears in this layer 93 do not result. The paper membrane is absorbent and has capillary action. That is any fats/oils that tend to flow from the inside of the bag are absorbed by this layer and spread over this layer because of its capillary action. This helps to prevent large amounts of fat or oil from escaping out of the top surface of the bag 91 through the perforations 92. Below the paper membrane 93 is a layer of fat or oil 94 and below this is a layer of flavourings 95. Below the flavouring layer is a layer of plastics or foil material 96. This layer 96 becomes perforated by the cook as described above. Below layer 96 is another layer of paper membrane material 97. This acts to absorb any fats or oils that have mixed with the flavourings and permeated through layer 96. These fats and/or oils are spread over the paper membrane layer 97 by capillary action as for layer 93. This layer is placed over the food during the cooking process and in this way the fats/oils together with the flavourings are spread evenly over the food in a gradual manner.

The plastics or foil layer 96 may have perforations 101 in it as shown in figure 10. These perforations 101 can be made by the cook as described above or may be pre-formed. Different numbers and distributions of perforations can be placed in this layer. In this way the amount and distribution of the flavourings and fat/oil over the food can be controlled. If only a few perforations 101 are used then the flavourings may be distributed only to very local regions of the food and not spread evenly over the food. This problem is alleviated by using the paper membrane layer 97.

The paper membrane layers 97, 93 can be made from any type of fibrous material that provides a capillary action for the fats and oils. Any type of material that has this capillary action and which tends not to rip or tear during the perforation process can be used. The material should also tend to re-seal itself after the perforation implement has been withdrawn.

When the flavour bag is being transported, or stored an additional tear-off layer or strip is provided over the membrane layer 97. This layer has no perforations in it and helps to keep the contents of the bag fresh and preserved. This type of tear-off layer can be provided over any outer part of the bag or may surround the whole bag as required.

Claims

1. A flavour bag suitable for imparting flavour into foods during the cooking process comprising:-

(I) an outer surround at least part of which is permeable to molten fat;

(ii) a first compartment within the surround, said compartment being adapted to contain edible fat; and

(iii) a second compartment within the surround, said compartment being adapted to contain a flavouring material such as herbs or spices,

wherein the first and second compartments share a common wall, at least part of which is permeable to molten fat.

2. A flavour bag as claimed in claim 1 wherein said common wall comprises a fat permeable inner layer which substantially bisects the bag.

3. A flavour bag as claimed in claim 1 or claim 2 wherein the common wall substantially spans the breadth of the bag.

4. A flavour bag as claimed in any preceding claim wherein the bag is at least partly formed from material which is otherwise substantially impermeable to molten fat but which is made permeable by perforations.

5. A flavour bag as claimed in any preceding claim wherein the bag is at least partly formed from fibrous material which is substantially permeable to molten fat.

6. A flavour bag as claimed in any preceding claim wherein any perforations in the outer surround are covered by a sheet of material that is substantially impermeable to molten fat and which is adapted to be removed from the surround before using the flavour bag.

7. A flavour bag as claimed in any preceding claim further comprising a cord attached to the bag, the cord being adapted to be pulled to remove the bag from food.

8. A flavour bag as claimed in any preceding claim further comprising a clip attached to the bag and adapted to secure the bag to food during the cooking process.

9. A flavour bag as claimed in any preceding claim incorporating a line of weakness in the bag such that in use the bag can be opened by tearing along the line of weakness.

10. A flavour bag as claimed in any preceding claim containing flavouring material such as herbs or spices.

11. A flavour bag as claimed in any preceding claim containing edible fat.

12. A flavour bag as claimed in any preceding claim containing flavouring material such as herbs or spices and edible fat.

13. A plurality of flavour bags as claimed in any preceding claim said bags being detachably joined in end to end alignment.

14. A flavour bag according to any preceding claim modified in that the outer surround is impermeable to molten fat but is adapted to be made permeable prior to use by piercing with a sharp pointed implement.

15. A flavour bag substantially as hereinbefore described with reference to and as illustrated in any combination of the accompanying drawings.

The Patent Office

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Claims searched:	1-15	**Date of search:**	14 May 1997

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): A23L 1/22; B65B 29/10; B65D 81/32,81/34

Other: Online; WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2294251 A	(CONTINENTAL) see whole document	1
A	WO 95/19715 A1	(RAHKONEN) see whole document	1
A	WO 94/08461 A1	(TIRKKONEN) see whole document	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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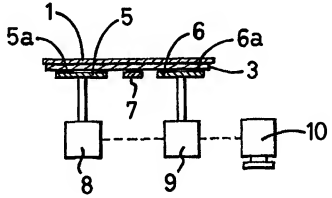
(54) Title: DEVICES FOR BLENDING MATERIALS

(57) Abstract

A device for blending materials comprising a carrier support (1) arranged to support a closed bag (3) containing a material to be blended, kneading means in the form of paddles (5) which are arranged to apply a kneading action to the bag walls for homogenising its contents, and clamping means (4) for holding the bag closed and against the carrier support (1) during kneading. The kneading means (5) is arranged to act in conjunction with the carrier support (1) and an island baffle (7) to cause the contents of the bag to circulate during kneading.



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Devices for Blending Materials

This invention relates to devices for blending materials eg mixing components of a mixture or homogenising single components. The materials may be liquids or semi-liquid matter, and in some cases solids, or powders or even gases. The invention is particularly concerned with the preparation of samples for bacteriological or chemical testing, but may also be used for the preparation of blended foods for example batters, pastries, sauces, baby foods and for the mixing of glues or paints or animal feeds additives.

A known blending device for preparation of bacteriological samples uses paddles and is described in GB 1 402 538. In use the specimen and diluent are contained in a sterile plastic bag and the paddles apply forces to the outside of the bag. This means that after processing the blender apparatus does not need to be cleaned and sterilised in preparation for further specimens, and so prevents cross contamination. This device includes two rectangular paddles of identical size and shape. The forces they impart to the sample are, for the most part, crushing. The reciprocating action of the paddles squeezes the specimen from side to side

horizontally within the bag so mixing the resulting debris.

An examination of the fluid dynamics of this arrangement by the applicants has shown that the mixing action is most effective at the bottom of the bag and is reduced towards the top with an area between the tops of the paddles where the homogenisation is minimal compared to the rest of the bag. Moreover we have appreciated that movement of liquid within the bag is important as it provides a form of washing action. The extraction of organisms requires the crushing or squeezing action and the washing action to not only release the organisms from the sample but also to drive them in to suspension. The resulting suspension must be as homogenous as possible and as representative as possible of the material under test.

It is an object of the present invention to provide an improved blender which alleviates the problems of the prior art.

According to the present invention there is provided a device for blending materials comprising a carrier support arranged to support a closed bag containing a

material to be blended, a kneading means which is arranged to apply a kneading action to the bag walls for homogenising its contents, and holding means for holding the closed bag against the carrier support during kneading, the kneading means being arranged to act in conjunction with the carrier support to cause the contents of the bag to circulate during kneading.

Circulation of the contents is advantageous because it can provide more uniform or effective mixing and homogenisation.

The holding means may comprise clamping means. When open ended sample bags are used the clamping means can be arranged to provide a temporary seal at the open end.

The kneading means may comprise at least one paddle arranged to act on the bag. Where a plurality of paddles are provided, the paddles can each be arranged to act on a different area of the bag, preferably while mutually out of phase.

Where the kneading means comprise at least one paddle said paddle can be shaped and dimensioned to cause and/or encourage circulation. Generally there should be a pair

of paddles which are asymmetrically arranged with respect to each other in a manner which promotes circulation.

The or each paddle may have a kneading surface which acts on the bag during kneading. The kneading surface can be shaped to cause and/or encourage circulation. In particular, the kneading surface may have a broad end and a narrow end. The displacement caused by the paddle at the broad end will then be greater than at the narrow end. This will tend to cause the contents of the bag to move in a direction from the broad end to the narrow end as the kneading surface acts on the bag.

The or each paddle can be arranged so that some portions of the kneading surface contact the bag before other portions of the kneading surface during kneading. This may cause/encourage movement of the contents.

A pair of paddles can be provided in an opposed relation such that the broad end of each paddle is arranged to act on the bag at a region adjacent to a region at which the narrow end of the respective other paddle is arranged to act. Arranging such a pair of paddles to act on the bag in anti-phase is one way to produce a circulation of the contents of the bag.

The kneading surface may be generally triangular. Each side of the generally triangular shape may be curved.

An island baffle can be provided and arranged to cause, encourage or allow circulation around the baffle to occur. The island baffle can be maintained in a fixed relation to the bag. Where a pair of paddles are provided the island baffle can be located between the paddles. Facing surfaces of the island baffle and one or more associated paddle can be spaced from one another. The spacing at the broad end of the paddle can be less than at the narrow end. The facing surfaces of the baffle can be convex, the facing surface of the paddle can be concave.

Preferably the arrangement is such that extruding of the material occurs as it circulates.

Preferably one end of the island baffle is spaced from one internal boundary of the bag so that a first gap is defined between that end and the respective boundary, while the other

end of the island baffle may be spaced from an opposing internal boundary of the bag so that a second gap is

defined between said other end and said opposing boundary.

Preferably the apertures are arranged so that when material is circulating, during kneading, the material passes through one gap in a first direction and through the other gap in an opposing direction.

Preferably the material is extruded on passing through each gap.

A lower internal boundary such as a lower end seal of the bag in a plane of circulation may be arcuate, and preferably is semi-circular. This can encourage circulation. The curvature of the boundary may closely match a curvature of another facing surface or surfaces of one or more paddle. The boundary and said other facing surface(s) will usually be substantially parallel.

An embodiment of the invention will now be described with reference to the accompanying drawings in which:

figure 1 is a side schematic view of a blending device prior to being loaded;

figure 2 is a side schematic view of the blending device

when loaded;

figure 3 is a partial front view of the blending device when loaded; and

figure 4 is a sectional view of the blending device on line iv-iv in figure 3.

A blending device generally comprises a door 1 which acts as a carrier support and is pivotable about one end. During use the door 1 acts as a backing support for a bag 3 containing a sample to be blended. Clamping sealing means 4 is provided to hold the bag 3 and provide a seal prior to and during operation of the device.

A kneading means which comprises a first paddle 5 and a second paddle 6 is provided, so that the bag contents can be kneaded by pressure against the backing support of the door. An island baffle 7 is provided between the paddles 5,6. The first paddle 5 has an associated driving means 8 for reciprocatingly driving the first paddle 5 in a direction which is substantially perpendicular to a kneading surface 5a of the first paddle 5. Similarly a second driving means 9 is provided for reciprocatingly driving the second paddle 6 in a direction which is substantially perpendicular to a kneading surface 6a of the second paddle 6. A common motor 10 provides the

power for both of the driving means 8,9 which are each in the form of transmission gearing arrangements. The island baffle 7 is mounted on the structure of the machine so as to remain essentially stationary in use.

The door is pivotable about the hinge between an open position in which the sample bag 3 can be loaded and a closed position in which the sample bag is brought into contact with the clamp 4, so sealing the bag and containing the contents therein. In the closed position the bag 3 and the sample contained therein are brought into contact with the kneading surfaces of the first and second paddles 5, 6 and the island baffle 7.

Referring particularly to figure 3, the first paddle 5 is formed as a generally triangular plate which is of substantially uniform thickness in the direction perpendicular to the kneading surface and in a plane parallel to the kneading surface is broader at one end than the other. In the orientation shown in figure 3, which is the typical orientation in which the device is used, the broad end of the first paddle 5 is disposed below the narrow end of the first paddle 5. Although the first paddle 5 is generally triangular, it has curved rather than straight sides and rounded ends rather than

angular vertices. The second paddle 6 has a substantially identical shape to the first paddle 5 but is disposed in an opposed relation to the first paddle 5. That is to say the narrow end of the second paddle 6 is disposed below the broader end in the orientation shown in figure 3.

The island baffle 7 is disposed between the first and second paddles 5, 6. Again, referring particularly to figure 3, the island baffle 7 is disposed so that a first end of the island baffle 7 is spaced from the clamp 4 and a second end of the island baffle 7 is spaced from an end seal 31 of a loaded sample bag 3. Thus, when a sample bag is loaded into the device gaps A are formed between the ends of the island baffle 7 and the interior boundaries of the bag formed by the upper and lower seals of the bag, the lower of which is semi-circular.

Each of the paddles 5, 6 has two convex sides 51, 61, 52, 62, which face away from the island baffle 7 and a concave side 53, 63 which faces towards the island baffle 7. The island baffle has two convex faces 71 and 72 each of which faces a respective one of the concave faces 53, 63 of the two paddles 5, 6. The facing surfaces 53, 63, 71, 72 of the two paddles 5, 6 and the island baffle 7 define two channels 11 and 12.

Assuming that a bag 3 containing a sample has already been loaded into the device so that the door is in the closed position and the bag is sealed by the clamp sealing means 4, the device can be used to homogenise the sample and diluent by using the motors 8 and 9 to reciprocatingly drive the first and second paddles 5, 6 substantially in anti-phase. That is to say, as the first paddle 5 is driven in a forward direction against the bag 3, the second paddle 6 is withdrawn from the bag 3 and vice-versa.

As the first paddle 5 is pushed against the sample containing bag 3 the solid material in the sample will tend to be crushed by the forward motion and these solid elements in addition to liquid and gaseous elements in the material will tend to be driven in an upward direction shown by the arrow 13. This is a direction from the broad end of the first paddle 5 towards the narrow end of the first paddle 5.This tendency for the material to move in the upward direction can be explained by the larger displacement caused by the broader end of the first paddle 5.

The island baffle 7 substantially prevents any transverse movement of the material in the central region of the

bag. Instead, this material is forced through the upper aperture A as shown by the arrow 14.

As the first paddle 5 is withdrawn from the bag 3 the second paddle 6 is pushed against the bag 3. Now the same effects occur but in the opposite direction so that the material is both crushed and driven downwards (in the orientation shown in figure 3) towards the narrower end of the second paddle 6, as shown by the arrow 15. The material is then driven through the lower aperture A as shown by the arrow 16.

This circulating action continues as the paddles 5, 6 are driven in anti-phase.

The circulating action which occurs is beneficial. This is because when homogenising specimens with an appropriate diluent to extract into suspension micro-organisms for subsequent analysis, it is important that the resulting suspension is as homogeneous as possible and is as representative as possible of the whole of the material under test. The circulation provided by the present device prevents some portions of the sample being less homogenised than others and helps to mix the sample as a whole.

The movement of the diluent created is also of importance because it is not only the crushing of solid elements in the sample which is important, but a washing action which helps to release the organisms from the sample and drive them into suspension.

A further advantage of the present device is that as the material is driven through the apertures A it is extruded and the combination of circulation, extrusion and crushing action improves the microbiological performance of the blender.

The end seal 31 of the bag 3 is semi-circular and is chosen to be of a curvature which closely matches that of the lower curved edges 52, 61 of the paddles. The curvature of the end seal 31 helps to encourage circulation to take place.

The functioning of the device is particularly effective when a gap of around 2mm is formed between the kneading surfaces and the surface supporting the bag.

It will be appreciated that other means can be used to cause, allow or encourage circulation. For example, the kneading surfaces 5a, 6a of the two paddles 5, 6 can be

further adapted to encourage circulation. In particular the paddles can be arranged so that the broad end of each paddle 5, 6 comes into contact with the bag and the material before the narrow end of the paddle. In the present embodiment that could be achieved by making the paddles 5, 6 with a wedged shaped cross section. Another possibility is to introduce other curved internal boundaries to the bag, for example, by providing a curved door clamp.

In an alternative an island baffle can be provided directly on the door/carrier support.

CLAIMS:

1. A device for blending materials comprising a carrier support arranged to support a closed bag containing a material to be blended, a kneading means which is arranged to apply a kneading action to the bag walls for homogenising its contents, and holding means for holding the closed bag against the carrier support during kneading, the kneading means being arranged to act in conjunction with the carrier support to cause the contents of the bag to circulate during kneading.

2. A device according to Claim 1 in which the holding means comprises clamping means.

3. A device according to Claim 2 in which the clamping means is arranged to provide a temporary seal at an open end of a sample bag disposed in the device.

4. A device according to any preceding claim in which the kneading means comprises at least one paddle arranged to act on the bag.

5. A device according to Claim 4 in which a plurality of paddles are provided, each paddle being

arranged to act on a different area of the bag.

6. A device according to Claim 5 in which the paddles are arranged to operate mutually out of phase.

7. A device according to any one of Claims 4 to 6 in which at least one paddle is shaped and dimensioned to cause and/or encourage circulation.

8. A device according to any one of Claims 4 to 7 which comprises a pair of paddles which are asymmetrically arranged with respect to each other in a manner which promotes circulation.

9. A device according to any one of Claims 4 to 8 which comprises a pair of paddles provided in an opposed relation such that a broad end of each paddle is arranged to act on the bag at a region adjacent to a region at which a narrow end of the respective other paddle is arranged to act.

10. A device according to any preceding claim further comprising an island baffle arranged to cause, encourage or allow circulation around the baffle to occur.

11. A device according to Claim 10 in which the island baffle is disposed such that when a bag is in place one end of the island baffle is spaced from one internal boundary of the bag so that a first gap is defined between that end and the respective boundary, while the other end of the island baffle is spaced from an opposing internal boundary of the bag so that a second gap is defined between said other end and said opposing boundary.

12. A device according to any preceding claim in which the arrangement is such that extruding of the material occurs as it circulates.

13. A device according to Claim 11 which is arranged so that material is extruded on passing through each gap.

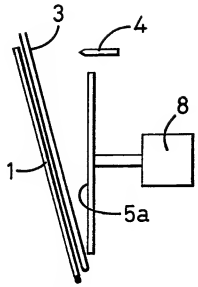

FIG. 1

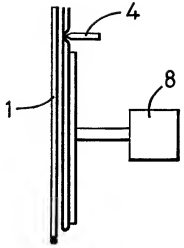

FIG. 2

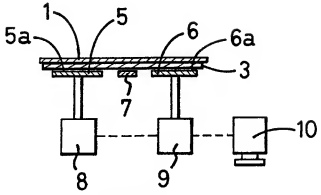

FIG. 4

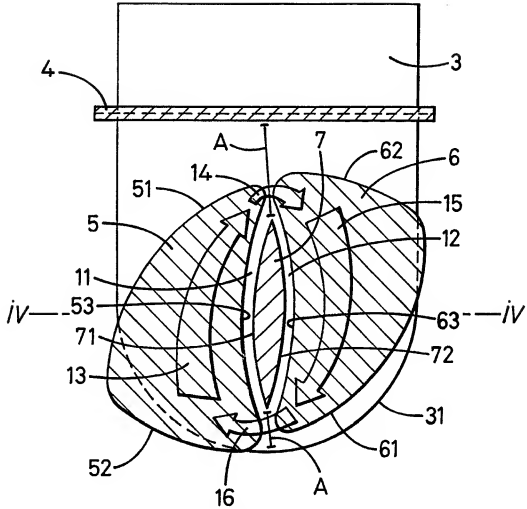

FIG. 3

INTERNATIONAL SEARCH REPORT

Interr nal Application No
PCT/GB 99/02855

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01F11/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 22 43 494 A (UNILEVER N.V.) 15 March 1973 (1973-03-15) the whole document & GB 1 402 538 A cited in the application ---	1-13
A	WO 97 43039 A (A.N.SHARPE) 20 November 1997 (1997-11-20) claims; figures ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 8, no. 102 (C-222), 12 May 1984 (1984-05-12) & JP 59 016532 A (HITACHI KOKI KK), 27 January 1984 (1984-01-27) abstract --- -/--	1

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the generel state of the art which is not considered to be of particular relevance

"E" earlier document but published on or efter the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 October 1999	02/11/1999
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	**Authorized officer** Cordero Alvarez, M

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 11, no. 262 (C-442), 25 August 1987 (1987-08-25) & JP 62 065724 A (CHIYODA TECH & IND CO LTD), 25 March 1987 (1987-03-25) abstract	1
A	DE 44 26 421 A (H.HARTMANN) 1 February 1996 (1996-02-01) claim 1	1

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interr onal Application No
PCT/GB 99/02855

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2243494 A	15-03-1973	GB 1402538 A	13-08-1975
		BE 788274 A	28-02-1973
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		CH 549406 A	31-05-1974
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Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/70923 A1

(54) Title: DUAL CHAMBER CLEANSING SYSTEM

(57) Abstract: The invention provides an at least dual compartment container containing at least one surfactant stripe and at least one water-in-oil emulsion stripe. By dispensing a water-in-oil emulsion stripe, greater deposition, particularly deposition of water soluble benefit agent (e.g. glycolic acid) is achieved than believed possible.

DUAL CHAMBER CLEANSING SYSTEM

The present invention relates to a composition for depositing both hydrophilic (e.g. glycolic acid, lactic acid, hydroxy caprylic acid, water soluble vitamins etc.) and hydrophobic (e.g. petrolatum forming the oil part of emulsion) benefit agents in greater amounts than previously possible when using PW shower gel type liquids and/or facial cleansers all while maintaining good foam stability.

More specifically, the present invention relates to a dual chamber system in which one composition/stripe comprises a surfactant; and a separate composition/stripe, which is co-dispensed, comprises a water-in-oil emulsion comprising one or more benefit agents. Use of a water-in-oil emulsion rather than an oil-in-water emulsion as the benefit agent stripe has unexpectedly been found to result in much greater deposition of benefit agent (water soluble benefit agents such as glycolic; non-water soluble benefit agents, and even "semi-soluble" benefit agents solubilized in other components, e.g., salicylic acid solubilized in polyalkylene glycol emulsified in oil).

It is greatly desirable to deposit soluble benefit agents (e.g. water soluble benefits such as glycolic acid or lactic acid) and/or hydrophobic agents (e.g. petrolatum) and/or those in between on the skin or other substrate.

However, deposition of benefit agent, particularly water soluble ones, is extremely difficult to accomplish,

especially from wash-off type products (e.g. shower gels) because the benefit agent will essentially wash off when the user rinses with water. Although it is easier to deposit a hydrophobic benefit agent (e.g. silicone or petrolatum), rinse-off can still be a problem here as well.

Unexpectedly, the present applicants have found that by forming a water-in-oil emulsion of, for example, a water soluble benefit agent in a hydrophobic emulsion and separately dispensing the benefit agent containing emulsion in one stripe and a surfactant containing composition in another, it is possible to deposit greater amounts of both the water soluble benefit agent and of the oil forming the emulsion than otherwise achievable (e.g. either through single stripe cleanser or through dual stripe cleanser having only oil-in-water emulsion rather than water-in-oil emulsion of invention).

The use of separate surfactant and benefit agent stripes is not itself new. For example, U.S. Patent No. 5,612,307 teaches a dual chamber package comprising separate surfactant and benefit agent stripe. The benefit agent in that reference is lipophilic benefit agent only rather than water-soluble benefit agent in oil emulsion. That is, the benefit agent is not in water-in-oil emulsion form such as the benefit agent stripe of the invention.

A multiple emulsion benefit stripe is taught in applicants' copending application entitled "Dual Chamber Cleansing System Comprising Multiple Emulsion" to St. Lewis et al., but this reference does not teach that a water-in-oil

benefit stripe in such dual chamber system can provide remarkable deposition relative to, for example, oil-in-water stripe.

Unexpectedly, the present applicants have found that a dual chamber dispenser comprising a surfactant containing stripe on one side and a water-in-oil emulsion containing benefit stripe on the other (wherein the internal water phase preferably, but not necessarily, contains at least one water soluble benefit agent) is able to deliver both the water soluble benefit agent and the oil which forms the emulsion to the skin or other substrate in greater amounts than otherwise possible, i.e. than if using single stripe or using, for example, an oil-in-water emulsion as the benefit stripe.

Thus, according to the invention there is provided an aqueous liquid cleansing and moisturizing composition comprising an at least dual chamber dispenser (in theory more than two stripes may be dispensed and the invention is not necessarily limited by the number of stripes) comprising:

(A) 10 to 99.9% by wt., preferably 30 to 99.9%, more preferably 50 to 99.9%, of a surfactant containing stripe wherein about 1 to 75%, preferably 5 to 70%, of said surfactant stripe comprises a surfactant selected from the group consisting of anionic, nonionic, zwitterionic and cationic surfactants, soap and mixtures thereof (water, solute, opacifier, bactericides and other standard ingredients may also be found in the stripe); and

(B) 0.1 to 99%, preferably 0.1 to 70%, more preferably 0.1 to 50% by wt., of a water-in-oil emulsion stripe comprising:

(1) about 1 to 99% of an internal aqueous phase comprising water, optional solute (0 to 30%, preferably .01 to 10% solute) and optional surfactant (0 to 30%, preferably 0.01 to 15%);

(2) 0.5 to 99%, preferably 1 to 80%, of the emulsion of an oil phase surrounding said internal aqueous phase;

(3) about 0.1 to 20%, preferably 1 to 15%, of a low HLB emulsifier (e.g. HLB under 10); and

(4) optionally, an effective amount (e.g. 0 to 40%, preferably 0.01 to 30%, more preferably 0.25 to 25%) of (1) a topically effective water-soluble compound (e.g. glycolic acid) found in the internal aqueous phase or (2) a "less" water soluble compound (e.g. salicylic acid) solubilized by, for example, polyalkylene glycol and/or other diluent such that it is solubilized in the internal aqueous phase.

Generally 1 to 40%, preferably 1 to 30%, of this "less soluble" compound (e.g. salicylic acid) is solubilized in the diluent (e.g. PAG).

Thus, the present invention relates to an at least dual chamber dispenser comprising a surfactant containing stripe on one side ((A) above) and a water-in-oil emulsion

containing stripe ((B) above) on the other. The water-in-oil emulsion comprises an internal water phase, which may contain a water soluble benefit agent (e.g. glycolic acid) or a benefit agent solubilized in a diluent (e.g. salicylic acid in polyalkylene glycol) wherein the internal phase is emulsified in an oil phase. Each of the various components is described in greater detail below.

SURFACTANT STRIPE (Component (A))

One stripe of the dispenser of the invention is the surfactant stripe. The surfactant containing stripe is really not limited in any way and any viable surfactant system may be used, although preferably this will be a "mild" surfactant system.

The surface active agent can be selected from any known surfactant suitable for topical application to the human body. As noted, mild surfactants, i.e. surfactants which do not damage the stratum corneum, the outer layer of skin, are particularly preferred.

One preferred anionic detergent is fatty acyl isethionate of formula:

$$RCO_2CH_2CH_2SO_3M$$

where R is an alkyl or alkenyl group of 7 to 21 carbon atoms and M is a solubilizing cation such as sodium, potassium, ammonium or substituted ammonium. Preferably at least three

quarters of the RCO groups have 12 to 18 carbon atoms and may be derived from coconut, palm or a coconut/palm blend.

Another preferred anionic detergent is alkyl ether sulphate of formula:

$$RO(CH_2CH_2O)_nSO_3M$$

where R is an alkyl group of 8 to 22 carbon atoms, n ranges from 0.5 to 10, especially from 1.5 to 8, and M is a solubilizing cation as before.

Other possible anionic detergents include alkyl glyceryl ether sulphate, sulphosuccinates, taurates, sarcosinates, sulphoacetates, alkyl phosphate, alkyl phosphate esters and acyl lactylate, alkyl glutamates and mixtures thereof.

Sulphosuccinates may be monoalkyl sulphosuccinates having the formula:

$$R^1O_2CCH_2CH(SO_3M)CO_2M;$$

and amino-MEA sulphosuccinates of the formula:

$$R^1ONHCH_2CH_2O_2CCH_2CH(SO_3M)CO_2M;$$

wherein R^1 ranges from C_8 to C_{20} alkyl, preferably C_{12} to C_{15} alkyl, and M is a solubilizing cation.

Sarcosinates are generally indicated by the formula:

$R^2CON(CH_3)CH_2CO_2M$,

wherein R^2 ranges from C_8 to C_{20} alkyl, preferably C_{12} to C_{15} alkyl, and M is a solubilizing cation.

Taurates are generally identified by the formula:

$R^3CONR^4CH_2CH_2SO_3M$,

wherein R^3 ranges from C_8 to C_{20} alkyl, preferably C_{12} to C_{15} alkyl, R^4 ranges from C_1 to C_4 alkyl, and M is a solubilizing cation.

Harsh surfactants such as primary alkane sulphonate or alkyl benzene sulphonate will generally be avoided.

Suitable nonionic surface active agents include alkyl polysaccharides (e.g. alkylpolyglucoside), lactobionamides, ethylene glycol esters, glycerol monoethers, polyhydroxyamides (glucamide), primary and secondary alcohol ethoxylates, especially the C_8 to C_{20} aliphatic alcohols ethoxylated with an average of from 1 to 20 moles of ethylene oxide per mole of alcohol.

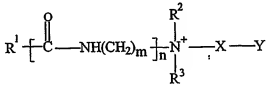
If the surface active agent comprises soap, the soap is preferably derived from materials with a C_8 to C_{22}

substantially saturated carbon chain and, preferably, is a potassium soap with a C_{12} to C_{18} carbon chain.

Mixtures of any of the foregoing surface active agents may also be used.

The surface active agent is preferably present at a level of from 1 to 75 wt.%, more preferably of from 5 to 70 wt.%.

It is also preferable that the composition includes from 0.5 to 15 wt.% of a cosurfactant agent with skin mildness benefits. Suitable materials are zwitterionic detergents which have an alkyl or alkenyl group of 7 to 18 carbon atoms and comply with an overall structural formula:



where R^1 is alkyl or alkenyl of 7 to 18 carbon atoms; R^2 and R^3 are each independently alkyl, hydroxyalkyl or carboxyalkyl of 1 to 3 carbon atoms;

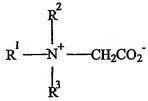
m is 2 to 4;

n is 0 or 1;

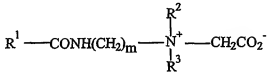
X is alkylene of 1 to 3 carbon atoms, optionally substituted with hydroxyl; and

Y is $-CO_2$ or $-SO_3$.

Zwitterionic detergents within the above general formula include simple betaines of formula:



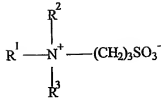
and amido betaines of formula:



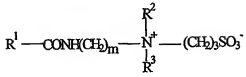
where m is 2 or 3.

In both formulae R^1, R^2 and R^3 are as defined previously. R^1 may, in particular, be a mixture of C_{12} and C_{14} alkyl groups derived from coconut so that at least half, preferably at least three quarters, of the group R^1 has 10 to 14 carbon atoms. R^2 and R^3 are preferably methyl.

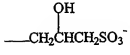
A further possibility is a sulphobetaine of formula:



or



where m is 2 or 3, or variants of these in which $-(CH_2)_3SO_3-$ is replaced by



R^1, R^2 and R^3 in these formulae are as defined previously.

A structurant may be added to the phase comprising the surface active agent. Suitable materials include swelling clays, for example laponite; fatty acids and derivatives thereof, in particular, fatty acid monoglyceride polyglycol ethers; cross-linked polyacrylates such as Carbopol™ (polymers available from Goodrich); acrylates and copolymers thereof; polyvinylpyrrolidone and copolymers thereof; polyethylene imines; salts such as sodium chloride and

ammonium sulphate; sucrose esters; gellants; and mixtures thereof.

Of the clays, particularly preferred are synthetic hectorite (laponite) clay used in conjunction with an electrolyte salt capable of causing the clay to thicken. Suitable electrolytes include alkali and alkaline earth salts such as halides, ammonium salts and sulphates.

The surface active agent phase may also comprise a thickening agent, i.e. a material which maintains the viscosity of this phase as the shear rate thereof is increased during use. Suitable materials include cross-linked polyacrylates such as Carbopol™ polymers available from Goodrich; natural gums including alginates, guar, xanthan and polysaccharide derivatives including carboxy methyl cellulose and hydroxypropyl guar; propylene glycols and propylene glycol oleates; salts such as sodium chloride and ammonium sulfate; glycerol tallowates; and mixtures thereof.

It should be appreciated that, although there is a separate benefit agent stripe (i.e. the multiple emulsion stripe W_1-O-W_2 defined by (B)), some benefit agent (e.g. hydrophobic agents such as silicone, petrolatum; or hydrophilic benefit agents or water soluble agents such as polyglycerin) may also be added to the surfactant stripe. Other components which may be used in the surfactant stripe are soluble/salts (e.g. alkali metal chloride), for example, to control viscosity; small amounts of opacifiers (preferably 0.2 to

2%), preservatives (0.2 to 2.0 wt. %), perfumes (0.5 to 2.0 wt.%) etc.

BENEFIT STRIPE (WATER-IN-OIL EMULSION)

The separate benefit agent stripe is a water-in-oil emulsion stripe.

The water-in-oil emulsion composition comprises:

(1) about 1 to 99% of an internal aqueous phase containing water, 0 to 30%, preferably 0.1 to 10% solute and 0 to 30%, preferably .01 to 15% optional surfactant;

(2) 0.5 to 99% of an oil phase surrounding said internal aqueous phase comprising a silicone compound, hydrocarbon compound (components may be volatile or non-volatile) or mixtures thereof;

(3) about 0.1 to 30% of a low HLB emulsifier; and

(4) optionally, a topically effective amount of (a) a water-soluble benefit agent or (b) less water soluble benefit agent dissolved in a compound which is itself soluble in water (e.g. salicylic acid in polyalkylene glycol), both (a) or (b) found in the internal water phase.

The water phase of the water-in-oil emulsion will generally comprise droplets with an internal aqueous phase containing water, optional solute (e.g. 0.01 to 10%) and a topically

active compound (e.g. glycolic and/or lactic acid); and an oil phase surrounding said internal aqueous phase. Droplets may range from 0.1 to about 10 microns and may be enveloped by a membrane or film comprising oil and low HLB emulsifier.

As noted, the aqueous phase comprises 1 to 99% by wt. of the water-in-oil emulsion with low HLB emulsifier separating aqueous and oil phases. The water phase may comprise water, solute and water-soluble or partially water-soluble topically active compound. It may also comprise additional active compounds and/or optional water soluble compounds providing desired esthetic or functional effect (e.g. perfume).

The aqueous phase may comprise 1 to 99%, preferably 10 to 95% of water-in-oil emulsion, more preferably 25 to 95% of emulsion.

Topically active compound may enter the water or oil phase depending on solubility (e.g. water soluble compound in water phase and oil soluble in oil phase). As noted, less water soluble compound may also be in water phase to dissolve, for example, within another compound which in turn is dissolved in water (e.g. salicylic acid in polyalkylene glycol emulsified in oil).

As used herein, the term "water soluble" means water soluble or water dispersible. A water soluble compound has a water solubility of at least 0.1 g per 100 ml of water and forms a true solution. A water soluble compound can be inherently water soluble or can be made water soluble by the addition

of a solubilizing compound, such as a coupling agent, a co-surfactant, or a solvent. A water dispersible compound remains dispersed in water for at least the time period necessary to manufacture the primary water-in-oil emulsion, i.e. at least about one hour.

Examples of compounds which may be water soluble are salicylic acid, α-hydroxy acids (lactic acid), water soluble vitamins (e.g. vitamin B and C) and water soluble antioxidants. Examples of solvents to help solubilize the less soluble compounds are alcohols such as polyalkylene glycol and ethers such as, for example, PEG 15 butyl ethers, PEG 15 stearyl ether or ethylene glycol monoethyl ether.

The topically active compound therefore can be one of, or a combination of, a cosmetic compound, a medicinally active compound or any other compound that is useful upon topical application to the skin or hair. Such topically active compounds include, but are not limited to, hair conditioners (e.g. water soluble quaternary ammonium compounds, alkoxylated and nonalkoxylated fatty amines, dimethicone copolyols, cationic polymers etc.), skin conditioners (e.g. humectants such as glucose, glycerin, propylene glycol, amino acids, vitamins, amino functional silicones, etc.), hair and skin cleansers, hair fixatives, hair dyes, hair growth promoters, deodorants (e.g. organic and inorganic salts of aluminum, zirconium, zinc and mixtures thereof), skin care compounds, permanent wave compounds, hair relaxers, hair straighteners, antibacterial compounds, antifungal compounds, anti-inflammatory compounds, topical anesthetics, sunscreens and other cosmetic and medicinal

topically effective compounds (e.g. antifungal, antibacterial).

Water

Sufficient water is present in the aqueous phase such that the aqueous phase comprises about 1% to about 95% by weight of the water-in-oil emulsion. Total water present in the water-in-oil emulsion composition is about 1% to about 99.9%, and typically about 25% to about 95%, by weight of the composition.

Optional

Among optional ingredients which may be included in the aqueous phase are solutes. Among solutes which may be added are salts such as alkali metal chloride. Solute added to the internal aqueous phase may comprise 0 to 30% by wt., preferably 0.1 to 10% by wt.

It is also possible to add surfactant to the aqueous phase though this is added generally to the other stripe (base stripe). The surfactant can be any of the surfactants discussed in connection with the surfactant stripe.

The aqueous phase also can include optional ingredients traditionally included in topically applied compositions. These optional ingredients include, but are not limited to, dyes, fragrances, preservatives, antioxidants, detackifying agents, and similar types of compounds. As noted above, the internal phase may also include polyalkylene oxide

components. These may be particularly useful for incorporating certain hydrophilic benefit agents (e.g. salicylic acid) which may otherwise be difficult to add to the aqueous phase. The optional ingredients are included in the aqueous phase of the emulsion in an amount sufficient to perform their intended function.

The Oil Phase

The oil phase may be volatile or non-volatile.

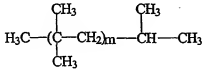
A volatile oil may comprise a volatile hydrocarbon oil which evaporates during the process of drying skin or hair, and thereby releases the internal aqueous W_1 phase, which includes the first topically active compound to contact the skin or hair.

In one embodiment, the oil may comprise a combination of a volatile oil and a non-volatile oil. In this embodiment, an oil can be designed to evaporate at a pre-selected temperature and provide a controlled release of the first topically active compound at the pre-selected temperature. Pre-selected temperatures are those encountered during normal hair drying, provided for example by a hair dryer, or provided by a curling iron.

As previously stated, the oil also can include a water insoluble topically active compound in a sufficient amount to impart a particular functional or esthetic effect (e.g. emolliency), as long as the topically active compound does

not adversely affect the emulsion composition (e.g. does not impart emulsion instability).

Volatile hydrocarbon compounds incorporated into the emulsion include, for example, isododecane and isohexadecane, i.e. PERMETHYL 99A, PERMETHYL 101A and PERMETHYL 102A, available from Presperse, Inc., South Plainfield, N.J. Other exemplary volatile hydrocarbon compounds are depicted in general structural formula (I), wherein n ranges from 2 to 5.



(I)

Another exemplary volatile hydrocarbon compound is ISOPAR M (a C_{13} to C_{14} isoparaffin available from Exxon Chemical Co., Baytown, Tex). Preferably, the volatile hydrocarbon is less than 50% unsaturated.

As previously stated, the oil also can be a non-volatile oil. The non-volatile oil comprises a non-volatile silicone compound, a non-volatile hydrocarbon, or a mixture thereof. Preferably, the non-volatile oil comprises compounds which contain less than 50% unsaturation. The non-volatile oil does not evaporate from the skin or hair. The first topically active compound therefore is released by rubbing the skin or hair to rupture the primary water-in-oil emulsion. A non-volatile oil phase has a boiling point at atmospheric pressure of greater than about 250°C.

Exemplary non-volatile silicone compounds include a polyalkyl siloxane, a polyaryl siloxane or a polyalkylaryl siloxane. Mixtures of these nonvolatile silicone compounds also are useful.

The non-volatile oil also can comprise a non-volatile hydrocarbon compound, such as mineral oil, petrolatum, sunflower seed oil, canola oil or mixtures thereof. Other exemplary non-volatile hydrocarbon compounds that can be incorporated into the oil phase include, but are not limited to, a branched 1-decene oligomer, like 1-decene dimer or a polydecene.

The oil also optionally can comprise (1) an oil, such as jojoba oil, wheat germ oil or purcellin oil; or (2) a water insoluble emollient, such as, for example, an ester having at least about 10 carbon atoms, and preferably about 10 to about 32 carbon atoms.

Suitable esters include those comprising an aliphatic alcohol having about eight to about twenty carbon atoms and an aliphatic or aromatic carboxylic acid including from two to about twelve carbon atoms, or conversely, an aliphatic alcohol having two to about twelve carbon atoms with an aliphatic or aromatic carboxylic acid including about eight to about twenty carbon atoms. The ester is either straight chained or branched. Preferably, the ester has a molecular wt. of less than about 500. Suitable esters therefore include, for example, but are not limited to:

(a) aliphatic monohydric alcohol esters (e.g. isopropyl isostearate, cetyl acetate, cetyl stearate);
myristyl propionate,
isopropyl myristate,
isopropyl palmitate,
cetyl acetate,
cetyl propionate,
cetyl stearate,

(b) aliphatic di- and tri-esters of polycarboxylic acids, (e.g. diisopropyl adipate);

(c) aliphatic polyhydric alcohol esters (e.g. propylene glycol dipelargonate); and

(d) aliphatic esters of aromatic acids, (e.g. C_{12} to C_{15} alcohol esters of benzoic acid).

Low HLB Emulsifier

The water-in-oil emulsion of the present invention also includes about 0.1% to about 30%, preferably about 0.1% to about 15%, on the weight of the oil of a low HLB emulsifier.

The low HLB emulsifier may comprise a silicon-free surfactant, or a blend of silicon-free surfactants, having an HLB value of about 10 or less (i.e. an HLB value of about 0.1 to about 10), an oil-soluble silicon-based surfactant, an oil-soluble polymeric surfactant, or mixtures thereof.

Preferably, the silicon-free surfactant or surfactant blend has an HLB value of about 1 to about 7. To achieve the full advantage of the present invention, the silicon-free surfactant or surfactant blend has an HLB value of about 3 to about 6. The term "oil-soluble" as used herein means a compound having a solubility of at least 0.1 g per 100 ml of oil phase to form a true solution.

The HLB value of a particular silicon-free surfactant can be found in *McCutcheon's Emulsifiers and Detergents, North American and International Editions, MC Publishing* , Glen Rock, NJ (1993) (hereinafter *McCutcheon's*). Alternatively, the HLB value of a particular surfactant can be estimated by dividing the weight percent of oxyethylene in the surfactant by five (for surfactants including only ethoxy moieties). In addition, the HLB value of a surfactant blend can be estimated by the following formula:

$$HLB = (wt.\%\ A)\ (HLB_A) + (wt.\%\ B)\ (HLB_B),$$

wherein wt. % A and wt. % B are the weight percent of surfactants A and B in the silicon-free surfactant blend, and HLB_A and HLB_B are the HLB values for surfactants A and B, respectively.

Low HLB surfactant can be a silicone-based surfactant or silicone-free surfactant.

Exemplary classes of silicon-free nonionic surfactants include, but are not limited to, polyoxyethylene ethers of

fatty (C_6 to C_{22}) alcohols, polyoxyethylene/polyoxypropylene ethers of fatty (C_6 to C_{22}) alcohols, ethoxylated alkylphenols, polyethylene glycol ethers of methyl glucose, polyethylene glycol ethers of sorbitol, and mixtures thereof.

Exemplary silicon-free nonionic surfactants are the ethoxylated alcohols having an HLB value of about 0.1 to about 10. An especially preferred ethoxylated alcohol is laureth-1, i.e. lauryl alcohol ethoxylated with an average of one mole of ethylene oxide. Other suitable ethoxylated alcohols include laureth-2, laureth-3 and laureth-4. Numerous other nonionic surfactants having an HLB of about 0.1 to about 10 are listed in McCutcheon's at pages 229 to 236. Other exemplary silicon-free nonionic surfactants having an HLB value of about 0.1 to about 10 include, but are not limited to, the ethoxylated nonylphenols, ethoxylated octylphenols, ethoxylated dodecylphenols, ethoxylated fatty (C_6 to C_{22}) alcohols having four or fewer ethylene oxide moieties, oleth-2, steareth-3, steareth-2, ceteth-2, oleth-3,and mixtures thereof.

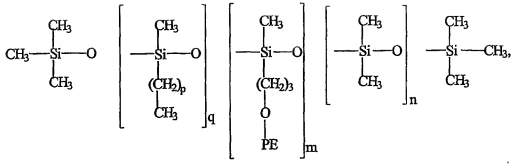
The emulsifier can also comprise a silicon-free surfactant blend having an HLB value of about 1 to about 10. The blend is a mixture of a sufficient amount of a surfactant having a low HLB value, i.e. about 0.1 to about 10, and a sufficient amount of a surfactant having a higher HLB value, i.e. about 1 to greater than about 10, such that the surfactant blend has an HLB value of about 1 to about 10. Exemplary, but non-limiting, nonionic surfactants having a

high HLB value are listed in *McCutcheon's* at pages 236 to 246.

A preferred silicone-free surfactant is PEG-30 dipolyhydroxystearate.

An exemplary oil-soluble silicon-based surfactant is a dimethicone copolyol, which is a dimethylsiloxane polymer having polyoxyethylene and/or polyoxypropylene side chains, such as DOW CORNING 322C FORMULATION AID, available from Dow Corning Co., Midland, Mich. The dimethicone copolyol has about 15 or fewer ethylene oxide and/or propylene oxide monomer units, in total, in the side chains. Dimethicone copolyols conventionally are used in conjunction with silicones because the silicon-containing surfactants are extremely soluble in a volatile or a nonvolatile silicone compound, are extremely insoluble in water, and have a low skin irritancy potential.

Another exemplary, but non-limiting, oil-soluble, silicon-based surfactant is an alkyl dimethicone copolyol, such as cetyl dimethicone copolyol available commercially as ABIL(R) EM 90 from Goldschmidt Chemical Corporation, Hopewell, Va. The alkyl dimethicone copolyols have the structure:



wherein:

p is a numeral from 7 through 17;
q is a numeral from 1 through 100;
m is a numeral from 1 through 40;
n is a numeral from 0 through 200; and

PE is $(C_2H_4O)_a(C_3H_6O)_b$-H having a molecular weight of about 250 to about 2000, wherein a and b are selected such that the weight ratio of C_2H_4O/C_3H_6O is from 100/0 to 20/80.

The emulsifier may also be an oil-soluble polymeric surfactant. Polymeric surfactants capable of forming water-in-oil emulsions completely cover the surface of the water droplet, are firmly anchored at the oil-water interface, the external oil phase is a good solvent for the stabilizing portion of the polymeric surfactant, and the thickness of the polymer layer on the oil side of the interface is sufficient to ensure stability. These surfactants may include ethoxy, propoxy and/or similar alkylene oxide monomer units, e.g. butoxy. The oil-soluble polymeric

surfactants act as surfactants and are not physically or chemically cross-linked in solution. The oil-soluble polymeric surfactants therefore are differentiated from polymeric gelling agents such as polyacrylic acid or polymethacrylic acid.

Accordingly, exemplary oil-soluble polymeric surfactants include, but are not limited to, polyoxyethylene-polyoxypropylene block copolymers, and similar polyoxyalkylene block copolymers. The oil-soluble block copolymers typically have less than about 20% by weight of ethylene oxide. Specific non-limiting oil-soluble polymeric surfactants include Poloxamer 101, Poloxamer 105, PPG-2-Buteth-3, PPG-3-Butech-5, PPG-5-Butech-7, PPG-7-Butech-10, PPG-9-Buteth-12, PPG-12-Buteth-16, PPG-15-Buteth-20, PPG-20-Buteth-30, PPG-24-Buteth-27, PPG-28-Buteth-35, and PEG-15 Butanediol. Other useful oil-soluble polymeric surfactants are polyamines, i.e. polyoxyethylene-polyoxypropylene block copolymers of ethylene diamine, having less than about 40% by weight ethylene oxide.

In accordance with an important feature of the present invention, the hydrophobic moiety of a silicon-free surfactant, silicon-containing surfactant or polymeric surfactant is sufficiently soluble in the oil phase such that a sufficient amount of the surfactant is present in the oil phase to stabilize the primary W_1/O emulsion. In one embodiment when the oil phase comprises a silicone compound, the surfactant phase comprises either a silicon-based surfactant, a silicon-free surfactant having a hydrophobic moiety preferably containing about ten to about fourteen

carbon atoms, an oil-soluble polymeric surfactant, or a mixture thereof. If the hydrophobic moiety of the silicon-free surfactant is saturated and includes more than about 14 carbon atoms, the silicon-free surfactant is insoluble in the silicone phase and the water-in-oil emulsion is unstable. If the hydrophobic moiety includes less than about 10 carbon atoms, the emulsion has a tendency to coalesce i.e. the emulsion droplets fuse to form large droplets. The amount of surfactant phase necessary to provide an emulsion of desired W_1/O droplet diameter varies with the amount of aqueous phase in the primary emulsion and is easily determined by those skilled in the art.

One particularly preferred emulsifier is cetyl dimethicone copolyol.

According to the invention, the benefit agent stripe (with water-in-oil emulsion) and surface active agent stripe are separate but combinedly dispensable from a packaging means and typically a single packaging means. Such a packaging means includes those systems which comprise two separate compartments. Ensuring that the surface active agent and benefit agent are separate can be achieved in a variety of ways. Packaging of the composition such that the surface active agent and benefit agent are presented in separate compartments or in separate domains within the packaging; including encapsulation of the benefit agent; and by processing of the composition by coextrusion to produce a striped product in which individual stripes contain either the surface active agent or benefit agent.

Compositions of the invention may be formulated as products for washing the skin, for example, bath or shear gels, hand washing compositions or facial washing liquids; pre- and post-shaving products; rinse-off, wipe-off and leave-on skin care products; products for washing the hair and for dental use.

The compositions of the invention will generally be pourable liquids or semi-liquids, e.g. pastes and will have a viscosity in the range of 250 to 100,000 mPas measured at a shear rate $10s^{-1}$ and 25°C in a Haake rotoviscometer RV20.

When the product is formulated as a shower gel the viscosity will generally be in the range 200 to 15000 mPas, preferably 500 to 15,000 measured at a shear rate $10s^{-1}$ and 25°C.

When the product is formulated as a facial wash product the viscosity will generally be in the range 3000 to 100,000 mPas measured at a shear rate $10s^{-1}$ and 25°C.

Other typical components of such compositions include opacifiers, preferably 0.2 to 2.0 wt.%; preservatives, preferably 0.2 to 2.0 wt.% and perfumes, preferably 0.5 to 2.0 wt.%.

Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts or ratios of materials or conditions or reaction, physical properties of materials

and/or use are to be understood as modified by the word "about".

Where used in the specification, the term "comprising" is intended to include the presence of stated features, integers, steps, components, but not to preclude the presence or addition of one or more features, integers, steps, components or groups thereof.

The following examples are intended to further illustrate the invention and are not intended to limit the invention in any way.

All percentages used, unless indicated otherwise, are intended to be percentages by weight.

Glycolic Acid and Sodium Glycolate Deposition Protocol

Procedure for Analyzing the Deposition of Glycolic Acid and Sodium Glycolate from Cleansers by Gas Chromatography (GC)/ Liquid Chromatography (LC)

Test Procedure (Pigskin):

Fresh Piglet skin (4 to 5 weeks old, male, white, no nipples and shaved) is used for the deposition studies. The skin is cut into approximately 12 cm x 5 cm pieces which are stretched and pinned onto a support. The surface of the skin is wetted with 250 ml water and 1 g of cleanser is applied to the wet surface (0.5 g benefit stripe and 0.5 g of surfactant phase). The skin is then washed by hand for

30 to 60 seconds, rinsed three times with 250 ml aliquots of water and patted dry with Kimwipe paper towel. A glass/plastic cylinder 3.3 cm in diameter is then placed in close contact with the skin surface and the skin is extracted three times with 3 ml aliquots of organic solvent (ethanol, acetone or tetrahydrofuran) followed by another three times with 3 ml aliquots of distilled water. The organic solvent extracts are combined.

The same is done for the water extracts (The water and/or organic solvent extractions can be repeated several times depending on the concentration of sodium glycolate, glycolic acid or other tested benefit agent on the pigskin). In the case of glycolic acid and sodium glycoside, for example, the organic extract will contain the glycolic acid and the water will contain the sodium glycolate.

Three sites are extracted on each of three pieces of skin for each formulation. The concentration of, for example, the sodium glycolate and the glycolic acid on the skin (in $\mu g/cm^2$) is determined by comparison with standard solutions on the Gas Chromatography and/or Liquid Chromotography using analytic procedure below.

Analytical Procedure

Apparatus 1:

A suitable Gas Chromatography (such as HP 5890 series II)

Sil-prep from Alltech (part #18013)

Gas Chromatography Setting:

Detector:	Flame Ionization Detector
Column:	HP-1 100%-Polydimethylsiloxane, Column length 25.9 m, Inside diameter 0.2 mm, Film thickness 0.33 mm
Injector Volume	4.0 µL to 5.0 µL
Gases:	Helium (carrier), Hydrogen and Air (Flame)
Detector temp.:	250°C
Injector temp.:	250°C
Oven temperature:	Set point 50°C, limit 300°C
Run time:	14.6 minutes

Oven Temperature Profile:

Initial temp.:	50°C
Initial time:	0.0
Rate:	25°C/minute
Final temp.:	290°C
Final time:	14.6 minutes

Standards:

Solutions at 4000, 2000, 1000, 500, 250, 125, 62.5, 31.3, 15.6, 7.8 µg/ml are prepared. Glycolic acid in organic solvent. Sodium glycolate in water.

Procedure

1. Place 1 ml of sample into a vial;
2. Completely remove solvent from sample using a vacuum;
3. Add one ampoule of sil-prep reagent to sample;
4. Sonicate or stir sample for approximately 15 minutes;
5. Inject silted sample into gas chromatograph.

Using procedures above, measure the area response of the standards. Calculate a regression line for the standards, including the zero point, using the measured area responses.

Measure the area response of the extract samples. Using the regression line calculate the unknown concentration of the extract.

Apparatus 2:

A suitable Liquid Chromatography (HP)

Liquid Chromatography Settings:

Detector:	UV Detector
Column:	Phenomenex LUNA 5u C18(2)
Injector volume:	5.0 µL to 50.0 µL
Mobil phase:	97% 20nM Potassium Phosphate @ pH 2.3:3% Methanol
Flow rate:	0.7 ml/minute
Temperature:	25°C

Run time: 30 minutes

Standards:

Solutions at 4000, 2000, 1000, 500, 250, 125, 62.5, 31.3, 15.6, 7.8 µg/ml are prepared.

Procedure

1. Place 1 ml of sample into a vial;
2. Completely remove solvent from sample using a vacuum;
3. Add one milliliter of mobile phase to sample;
4. Inject sample into LC.

Using procedures above, measure the area response of the standards. Calculate a regression line for the standards, including the zero point, using the measured area responses.

Measure the area response of the extract samples. Using the regression line calculate the unknown concentration of the extract.

EXAMPLES

Example 1 - Preparation of Water-Oil Emulsion (Benefit Agent Stripe)

Ingredients

(1) Glycolic Acid Solution (44% active @ pH 4) (glycolic acid would be used as the benefit agent in internal aqueous phase);

(2) Petrolatum (oil phase);

(3) Abil EM90 Goldschmidt (cetyl dimethicone copolyol low HLB emulsifier);

(4) Borage seed oil;

(5) Glydant II (preservative)

Preparation

In a beaker, petrolatum (oil phase), EM90 (emulsifier) and borage seed oil were added. Petrolatum can be any of different petrolatums including Fuchs Silkolene 910, Penreco's snow white, lily white, blond, etc. Other oils which can be used as oil phase include Guerbet® esters such as, for example, octyldodecyl recionoleate; silicone emulsions; mixtures of petrolatum and silicone, etc. Other oils which can be used as oil phase include Guerbet® esters such as, for example, octyldodecyl recionoleate; silicone emulsions; mixtures of petrolatum and silicone, etc.

Contents were heated to approximately 65 to 70°C (allowing petrolatum or oil to melt). Contents were stirred at approximately 800 to 900 rpms. While stirring, glycolic acid solution (premix of Example 2) (or salicylic acid in PEG if this was the benefit agent in aqueous phase) was added dropwise at pH 4 while stirring at 700 RPM. After addition of glycolic acid (or other benefit agent), mixture

was homogenized at 10,000 rpm for 10 to 15 minutes, mixture was cooled to 50°C and Glydant II (preservative) was added.

NaOH was in final stripe because it was part of the glycolic acid premix as made in Example 2.

Example 2

Preparation of Glycolic Acid Premix Used to Prepare Benefit Agent Stripe

Ingredients

(1) Glycolic Acid Solution (44% active @ pH 4);
(2) Water;
(3) NaOH @ 50%;
(4) Glycolic Acid @ 99.0%;
(5) Carbomer (optional); helps to thicken and may aid deposition.

Preparation

Water was added to a beaker. Glycolic acid was added and stirred until glycolic acid had dissolved. Glycolic acid solution was cooled to 0°C. NaOH was slowly added (drop-wise). After addition of NaOH, ingredients were cooled to room temperature. Carbomer was optionally added to solution slowly, stirring rapidly until Carbomer was fully dispersed. Solution became viscous.

Example 3

Following is an example of a "Base" stripe which was prepared to be used as surfactant stripe phase ((A)):

Ingredient	% By Wt.
Acyl Isethionate	1 to 10%
Betaine	5 to 15%
Sodium Lauryl Ether Sulfate	2 to 5%
Nonionic	0 to 8%
NaOH	0 to 2%
Lytron 621 (Opacifier)	0 to 2%
Antil 141 (Thickener)	0 to 3%
Preservative (e.g., Glydant II)	0 to 2%
Water and optional fragrance	To balance

Example 4 (Dual Composition)

The following water-in-oil (Petrolatum) benefit agent stripe (Stripe B) and base (Central Base, Stripe A) were prepared:

Stripe A - Base

Ingredient	% Active
Cocamidopropyl betaine	0 to 5
Sodium cocoyl isethionate	6 to 8
LAS	6 to 9
Cationic polymer (Jaguar C13S ex Rhone Poulenc)	1.5
Glycerin	0 to 20
Coco monoethanolamide	0 to 10
Thickeners	0 to 1.0
Fragrance, minors	0 to 1.0
Water	To balance

LAS = linear alkyl benzene sulphonate

Stripe B - Benefit Agent Stripe (Water-in-Oil Benefit Stripe)

Ingredient	% Active
Petrolatum	36.6
Glycerin	10.0
Cetyl dimethicone copolyol	1 to 5.0
Borage seed oil	1.0
Hydroxyacetic acid (glycolic acid)	20.0*
Ceteth-20 (NI Surfactant)	0.1
Carbopol	1.0
Sodium hydroxide	5 to 6
DMDM Hydantoin	0.2
Water	To balance

*In general in both base and stripe phases, levels come out as half of the amount when dispersed. Thus, 20% glycolic in benefit agent stripe is dispersed as 10% glycolic when out of the container.

Comparative A (Oil-In-Water Benefit Stripe)

The following dual stripe composition was also prepared but, in contrast to Example 4, the benefit agent stripe was not water-in-oil emulsion with 10% glycolic acid but an oil-in-water emulsion with 10% glycolic. The base and benefit stripes are as follows:

Stripe A - Base

Ingredient	% Active
Cocamidopropyl betaine	10.0
Sodium cocoyl isethionate	3.0
Sodium laureth sulfate	2.0
Thickener	0.0 to 5
Fragrance, minors	0 to 1.0
Water	To balance

Stripe B - Benefit Agent (Oil-In Water Emulsion)

Ingredient	% Active
Petrolatum	36.0
Borage seed oil	1.0
Hydroxyacetic acid (glycolic acid)	20.0
Ceteth 20 (NI Surfactant)	0.1
Carbopol	1.0
Sodium hydroxide	5 to 6
DMDM Hydantoin	0.2
Water	To balance

Benefit Agent in Comparative contains no glycerin.

Comparative B (Single Cleanser)

The following single cleanser system was prepared and was used in Example 5 set forth below:

Ingredient	% Active
Cocamidopropyl betaine	10.0
Sodium acyl isethionate	3.0
Sodium laureth sulfate	2.0
Borage seed oil	1.0
Hydroxyacetic acid (glycolic acid)	10.0
Sodium hydroxide	5 to 6
DMDM Hydantoin	0.36
Water	To balance

Example 5

Using the composition of Example 4 and of the Comparative A (dual cleanser where glycolic acid is directly in water phase), these were compared for deposition results using protocol set forth previously and the results are set forth below:

O/W Composition	W/O Composition
32 $\mu g/cm^2$	432 $\mu g/cm^2$

These paragraphs clearly show that a much greater amount of glycolic acid was deposited from W/O emulsion system than from O/W emulsion system.

Example 6

Applicants also compared deposition from water-in-oil emulsion system from dual stripe cleanser system compared to deposition from a single stripe cleanser as set forth in Comparative B. These results are as follows:

Single Stripe	**Dual Stripe with W/O Emulsion in Benefit Stripe**
5.0 $\mu g/cm^2$	432 $\mu g/cm^2$

These paragraphs clearly show that a much greater amount of glycolic acid was deposited from W/O emulsion system than from single system.

Example 7 - Benefit Stripe with Petrolatum and Salicylic Acid (2%)

A dual chamber composition was prepared having a surfactant base stripe as set forth in "A" below and benefit stripe asset forth in "B" below:

A - Surfactant Base Stripe

Ingredient	% Active
Cocoamidopropyl betaine	10
Sodium cocoyl isethionate	3
Sodium laureth sulfate	2
Propylene glycol & PEG 55 Propylene glycol oleate	0.5
Opacifier	0.34
Perfume/fragrance	0.2
DMDM Hydantoin	0.2
Water	To balance

B - Petrolatum and Salicylic Acid Benefit Stripe

Ingredient	% Active
Silkolene 910 petrolatum	48.3
Cetyl dimethicone copolyol	4.7
Salicylic acid	4.0
Polyethylene glycol*	10.0
NaOH	5.46
Preservative	0.2
Water	To balance

*PEG 300

This is example of salicylic acid in PEG as benefit agent in oil (petrolatum) stripe.

Example 8

In order to show enhanced deposition of salicylic acid benefit stripe (Example 7), applicants compared dual stripe of Example 7 to a dual stripe composition with water-oil-water emulsion. The water-oil-water stripe and benefit stripe of comparative are set forth below:

Surfactant

Ingredient	**% Active**
Betaine	10.0
Sodium Cocoyl Isethionate	3.0
Sodium Laureth Sulfate	2.0
Propylene Glycol and PEG-55 Propylene Glycol Oleate	0.5
Styrene Acrylate Copolymer	0.34
Perfume/Fragrance	0.2
DMDM Hydantoin	0.2
Water	83.76

Benefit Stripe

Ingredient	% Active
Silkolene5 910 Petrolatum	36.0
Cetyl Dimethicone Copolyol	3.6
Salicylic Acid	4.0
Polyethylene Glycol	10.0
Ceteth-20	0.1
Carbopol Thickener	1.0
Sodium Hydroxide	5.6
Water	39.50
DMDM Hydantoin	0.2

Deposition results of use of WOW emulsion compared to WO emulsion of Example 7 are set forth below:

WOW Emulsion	Example 7
Deposition: 3 g/cm^2	171 g/cm^2.

This example clearly shows benefit of W/O emulsion relative to WOW emulsion.

Example 9 - Dual Chamber with Different Base Stripe ("A") and Benefit Stripe

A - Surfactant Base Stripe

Ingredient	% Active
Linear alkyl benzene sulphonate (LAS)	7.5
Acyl isethionate	7.5
Cocomonoethanolamide	5.0
Glycerin	10.0
Guar hydroxypropyl trimonium chloride	1.0
Opacifier	0.34
Fragrances, preservative	0.4
Water	To balance

B - Petrolatum & Salicylic Acid Base Stripe

Ingredient	% Active
Cream white petrolatum	48.3
Cetyl dimethicone copolyol	4.7
Salicylic acid	4.0
PEG	10.0
NaOH	5.46
Preservative	0.2
DMDM Hydantoin	0.2
Water	To balance

This shows use of dual stripe with benefit agent stripe using slightly different petrolatum and with slightly different surfactant base "A".

Example 10

The following are examples of two other petrolatum benefit stripes which may be used (as stripe "B") with any of the surfactant stripes (stripe "A") of the invention.

Benefit Stripe with 10% L-Lactic Acid and 2% Salicylic Acid

Stripe B - Benefit Agent (Oil-In Water Emulsion)

Ingredient	% Active
Petrolatum	30.0
PEG 300	10.0
Borage seed oil	1.5
L-Lactic acid	20.0
Cetyl dimethicone copolyol	3.0
Salicylic acid	4.0
Preservative	0.2
NaOH	4.5
Water	To balance

Benefit Stripe with 8.5% Glycolic Acid & 7.5% Menthyl Lactate

Ingredient	% Active
Petrolatum	40.0
Cetyl dimethicone copolyol	4.0
Borage seed oil	1.5
L-Menthyl lactate	15.0
Hydroxyacetic acid (Glycolic)	17.2
Preservative	0.2
NaOH	4.68
Water	To balance

This example clearly shows that a variety of emollients/benefit agent can be used in the benefit stripe of the invention.

CLAIMS

1. An aqueous liquid cleansing and moisturizing composition comprising:

(A) 10 to 99.9% by wt. of a surfactant stripe comprising 1 to 75% by wt. of a surface active agent selected from the group consisting of anionic, nonionic, zwitterionic and cationic surface active agents, soap and mixtures thereof; and

(B) 0.1 to 99% by wt. of a benefit agent stripe comprising a water-in-oil emulsion where said emulsion comprises:

(1) 1 to 99% of an internal aqueous phase containing water, optional solute and optional surfactant;

(2) 0.5 to 99% at an oil phase surrounding said internal aqueous phase;

(3) 0.1 to 20% of a surfactant emulsifier having HLB of below 10; and

(4) optionally, a topically effective amount of a water-soluble or partially water-soluble benefit agent in the internal aqueous phase.

2. A composition according to claim 1, wherein surfactant of (A) comprises 5 to 70% of stripe.

3. A composition according to claim 1 or 2, wherein benefit agent is added to surfactant stripe (A).

4. A composition according to any one of the preceding claims, wherein water-in-oil emulsion comprises 0.1 to 10% by wt. solute.

5. A composition according to any one of the preceding claims, wherein oil phase of water-in-oil emulsion encapsulates internal aqueous phase to form droplets of about 5 to about 1000 μm.

6. A composition according to any one of the preceding claims, wherein emulsifier having HLB below 10 comprises 0.1 to 15% of oil phase.

7. A composition according to claim 6, wherein emulsifier is a dimethicone copolyol.

8. A composition according to any one of claims 1 to 7, wherein topically effective compounds of water-in-oil emulsion comprises glycolic acid.

9. A composition according to any one of claims 1 to 7, where topically effective compound comprises salicylic acid.

10. A composition according to any one of claims 1 to 7, wherein topically effective compound comprises lactic acid.

11. A composition according to any one of claims 1 to 7, wherein topically effective compound comprises lactic acid and salicylic acid.

12. A composition according to any one of claims 1 to 7, wherein topically effective compound comprises alkyl ester of lactic acid.

13. A composition according to any one of claims 1 to 7, wherein topically effective compound comprises glycolic acid and alkyl ester of lactic acid.

14. A composition according to any one of the preceding claims, wherein external aqueous phase comprises 20 to 95% water-in-oil emulsion.

INTERNATIONAL SEARCH REPORT

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PCT/EP 01/03440

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C11D3/37 C11D3/20 C11D3/18 C11D17/04 A61K7/50
A61K7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C11D A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	WO 96 41610 A (UNILEVER PLC) 27 December 1996 (1996-12-27) claims	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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